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RSENIC IN FOODS

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ARSENIC IN FOODS

VOLUMES 1-4

FOOD ANNOTATED BIBLIOGRAPHY No. 40

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INTRODUCTION

Food Annotated Bibliographies (FABs) are collections of abstracts on specific topics in food science and technology. The topics are chosen by the staff of the International Food Information Service as being of particular interest or importance. The topics normally interest individual workers, who may not require the full information provided in Food Science and Technology Abstracts, from which the abstracts for the FABs are taken. The size and the cost of the FABs are controlled as much as possible with the interests of individual workers in mind.

Titles of the FABs now available are given on the back cover of this booklet. New titles are being added at the rate of about 10-20 per year. For up-to-date lists of FABs or suggestions for new topics please write to the address given overleaf. New subjects are searched for at least the five most recent volumes of Food Science and Technology Abstracts. Thereafter each FAB is updated monthly. Copies of each months abstracts on any topic may be obtained as indicated on the back cover of this publication. At the end of each volume of up-dating, the abstracts are merged and made available as a separate supplement to the original FAB.

Some of the larger FABs have been divided into sections to facilitate use. Abstracts are not printed in more than one section. The larger FABs also have subject indexes provided.

Copies of all original articles referred to in the abstracts may be bought (or occasionally borrowed) from the International Food Information Service. A form for ordering these is provided at the end of this FAB.

Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would in any case encourage readers to write or telephone us with any comments or queries they may have.

J. NEWTON
ASSISTANT EDITOR

3 C 83
[Chlorinated pesticide and arsenic residues in fruit and green vegetables on the Swedish market in 1964-67:]
Westöö, G.; Noren, K.
Var Föda 1968 (9) 73-89 (1968) [Sv, en] [Statens Inst. för Folkhälsan, Stockholm, Sweden]

4 D 153
Food additives. Arsenic.
Anon.
Federal Register 33 (242, Dec. 13) 18487 (1968) [En]
The following tolerances are established under the US Federal Food, Drug and Cosmetic Act for residues of As in edible tissues and by-products of swine: 2 ppm in liver and kidney; 0.5 ppm in muscle meat and by-products other than liver and kidney. CAS

7 C 350
[Metal contaminants in milk and milk products.]
Metalle als Fremdstoffe in Milch und Milchprodukten.
Kästli, P.
Schweizer Archiv für Tierheilkunde 111 (3) 149-53 (1969) [14 ref. De, fr, it, en] [Humboldtstrasse 55, Bern, Switzerland]
Increases in amounts of Al, As, Cu, Fe, Hg, I, Mo, Pb and Zn contained in milk, through secretional and post-secretional contamination, are described. These metals are discussed with regard to their effect from the point of view of hygiene and detraction from quality of milk and milk products. [See also Int. Dairy Fed. a. Bull. (1968) part 5.] AS

7 P 649
Adequacy of trace minerals in bovine milk for human consumption.
Oberleas, D.; Prasad, A. S.
American Journal of Clinical Nutrition 22 (2) 196-99 (1969) [25 ref. En] [Dept. of Med., Wayne St. Univ. School of Medicine, Detroit, Michigan 48207, USA]
The relationship between the amount of trace minerals, Fe, Cu, Zn, Co, I, Cr, Se Mo Ni, As, B, Br, F and V in bovine milk and human requirement for these minerals is discussed. It is concluded that consumption of only bovine milk would produce a dietary deficiency of Fe, Cu, and I and probably F. SPT

9 A 231
[Second seminar on methods for determination of trace elements in biological material.]
Karvanek, M.
Prumsyl Potravin 19 (10) 521-22 (1968) [Cs]
The seminar was held in Prague, May 16th 1968, by the specialized group for food and agricultural chemistry of the Czechoslovak Chemical Society attached to the Czechoslovak Acad. of Sci. Papers read concerned: atomic absorption spectrophotometry; a method for determining the Hg content in flour by activation analysis and of Cu in biological material; polarographic determination of some heavy metals in foodstuffs; photometric determination of various trace elements; and the determination of F, Se, Co, Fe, As and other elements. STI

9 J 746
Analyses of some organochlorine pesticides and arsenic in fruits, berries, and vegetables on the Swedish Market in 1964-1967.
Westöö, G.; Noren, K.; Andersson, M.
Acta Agriculturae Scandinavica 19 (1) 33-39 (1969) [9 ref. En] [Dept. of Food Hygiene, Nat. Inst. of Public Health, Stockholm, Sweden]
From 1964-67 ~2200 samples (~50% Swedish and ~50% imported) of fruits, berries and vegetables (including potatoes), and ~200 samples of apples and pears (imported), were analysed for organochlorine pesticides and As respectively. For organochlorine pesticides, samples for gas and thin-layer chromatography were prepared by extraction with a mixture of 2-propanol and hexane, followed by chromatography on Florisil. Recovery of pesticides added to control samples, fell in the range 77-107%. Tolerance levels in Sweden were, in mg/kg: aldrin 0.1 (for carrots 0.05 after July 1st 1967); dieldrin 0.1 (for carrots 0.05 after July 1st 1967); DDT 1.0 (pears and apples 2.0); lindane 1.0. In 91% of all samples of fruit, berries and vegetables the content was ⩽10% of these tolerances, 10 samples out of ~2200 exceeded them, max. excess being 50% of the tolerance. DDD, Kelthane, tetradifon, ovex and As were only found in apples and pears (Kelthane also in strawberries). No Swedish tolerances have yet been fixed for these. AB

11 A 289
The determination of arsenic in organic and inorganic arsenic compounds: a radioisotope-dilution substoichiometric application.
Arnold, A.; Davis, S.; Jordan, A. L.
Analyst 94 (1121) 664-69 (1969) [8 ref. En] [Div. of Pharmacology and Toxicology, Food and Drug Administration, Dept. of Health, Education, and Welfare, Washington, DC 20204, USA]

11 A 300
Distribution of arsenic residues by activation analysis.
Geisman, J. R.; Carey, W. E.; Gould, W. A.; Alban, E. K.
Journal of Food Science 34 (3) 295-98 (1969) [7 ref. En] [Dept. of Horticulture, Agric. Res. and Development Centre, Wooster, Ohio 44691, USA]
Arsenic bearing compounds have been used as insecticides, fungicides and herbicides. Widespread use of these chemicals could lead to build-up in the soil. Detection of As requires special apparatus and sophisticated techniques. A method using neutron activation analysis was developed that required only drying of samples and encapsulation. Using activation analysis, it was found that As was concentrated in the roots of tomato plants. Data indicated a discrimination within the plant between fruit, stems and leaves, and root. Thus, it was concluded that soil concn. of As would have to be at the level that causes a reduction in fruit size and/or yield before fruit concn. of As would exceed the tolerance. This situation is not likely to occur at concn. used for defoliation of horticultural crops prior to mechanical harvest. Activation analysis could be used to detect μg

quantities of As in mg size samples. The method was precise and repeatable and did not require elaborate sample preparation techniques. AS

VOLUME 2

01 S 59
Dry ashing method for the determination of total arsenic in poultry tissues.
Morrison, J. L.; George, G. M.
Journal of the Association of Official Analytical Chemists 52 (5) 930-32 (1969) [6 ref. En] [Dept. of Biochem., Salsbury Lab., Charles City, Iowa 50616, USA]

A method is described for the determination of As in poultry tissue, which is sensitive to levels of <0.1 ppm. Tissue samples are dry-ashed in the presence of MgO and $Mg(NO_3)_2$ and the As is determined colorimetrically with silver diethyldithiocarbamate. As content in the tissue is determined from standard curves prepared for each tissue; this technique corrects for losses which occur during the ashing step. AS

3 D 136
[Jam.]
Union of Soviet Socialist Republics, Komitet Standartov
Gosudarstvennyi Standart GOST 6442-69 12 pp. (1969) [Ru]

This standard was introduced on 1 Jan., 1970. It lists characteristics and descriptions of different shapes of fruit jams and jellies, the latter containing agar (Baltic Sea), pectin, or agaroid (Black Sea agar), and regulations on inspection and analysis, packaging, labelling, transport and storage. Composition standards for contents of moisture, reducing substances and ash, and for titratable acidity and max. Cu content are given for all or some of the products. There is no tolerance for Pb and As salts in any of the products and for H_2SO_3 derivatives and benzoic acid in jellies. Max. content in other forms of jam is fixed at 100 mg/kg for H_2SO_3 derivatives as SO_2 and at 0.07% for benzoic acid. Special packaging and storage regulations for products intended for the Arctic, Soviet Far North and remote regions are listed. SKK

3 N 76
[Radioactivation analysis of trace arsenic in refined soybean, sunflower, and rapeseed oils.]
Shinbori, Y.; Kuwahara, H.
Journal of the Japanese Oil Chemists Society 18 (3) 147-48 (1969) [1 ref. Ja, en] [Musashi Inst. Technol., Kawasaki, Japan]

The irradiation was carried out in a TRIGA-II small reactor with neutron flux of 10^{11} $_n/cm^2/sec$ for 20 h of the max. irradiation time. After cooling, the sample was dissolved in acid by treating with HNO_3-H_2SO_4-$HClO_4$ (1:1:1) in the presence of an As carrier. The distillation of As was carried out nearly according to B. Sjöstrand [Anal. Chem., 1964, 36, 814]. The average chemical yield was 82% for As. The sensitivity of the method was 10^{-3} ppm. No As could be detected in 3 commercial samples of refined soybean and rapeseed oils nor in 2 samples of refined sunflower oil. Only 1 sample of the latter contained 1.0×10^{-3} ppm As. SKa

4 S 333
Distribution of arsenic from poultry litter in broiler chickens, soil, and crops.
Morrison, J. L.
Journal of Agricultural and Food Chemistry 17 (6) 1288-90 (1969) [27 ref. En] [Dept. of Biochem., Salsbury Lab., Charles City, Iowa 50616, USA]

The effect of the presence of organoarsenicals from feed additives in poultry house litter was investigated with respect to the distribution of As in chickens raised on this litter, to the distribution of As in soil fertilized with this litter, and to the distribution of As in crops raised on soil fertilized with this type litter. Although measurable amounts of As (15-30 ppm) were found in litter, the As content of soil and crops was unaffected by the use of poultry litter as fertilizer. Similarly, the As content of birds was unaffected when raised on this type litter. AS

4 T 115
[Determination of mineral elements in vinegars.]
Villanua, L.; Carballido, A.; Parga, M. C.
Anales de Bromatologia 21 (2) 117-29 (1969) [35 ref. Es, en] [Dept. Investigaciones Bromatologicas (C.S.I.C.), Escuela de Bromatologia, Univ. Madrid, Spain]

The processes for the manufacture of vinegar are reviewed historically, and the present legal requirements in Spain and other countries are summarized. A series of 15 samples of Spanish vinegars was examined, and the sulphate, chloride, Cu, Fe, Zn, Pb, As, and ash contents determined. The results were tabulated, and compared with the legal standards; only two of the samples were found not to comply. HSi

6 D 482
Health laws and regulations - France.
World Health Organization
International Digest of Health Legislation 20 (4) 774-87 (1969) [En] [Geneva, Switzerland]

A selection of French health laws and regulations is given including the following which relate to the food industry: milk and milk products: rennet. Decree No. 69-475 of 14 May 1969 to amend the Decree of 25 March 1964 embodying public administrative regulations for the implementation of the Law of 1 Aug. 1905 concerning the prevention of fraudulent practices, in respect of milk and dairy products [See Journal officiel de la Republique francaise, 29 May 1969, No 124, 5315-16]; food hygiene: restrictions on the use of arsenical, antimonial and oestrogenic substances in the feeding stuffs of animals intended for human consumption. Decree No. 69-573 of 6 June 1969 to amend Decree No. 65-692 of 13 Aug. 1965 [See Journal officiel de la Republique francaise, 13

June 1969, No. 137, 5918]; and Decree No. 69-578 of 12 June 1969 amending the Decree of 20 Aug. 1939 concerning the wholesomeness of oysters, mussels and other shellfish [See Journal officiel de la Republique francaise, 13 June 1969, No. 137, 5923]. VJG

7 D 530
Current food additives legislation - Uruguay.
Food and Agriculture Organization
Current Food Additives Legislation 1969 (127) 12 (1969) [En] [Rome, Italy]

Decree No. 193/969 of 18 April 1969 approving the provisional standard for nationally produced canned peaches in syrup, to which all exports of the product must conform as from 1 June 1969, contains the following provisions regarding additives and contaminants: use of preservatives may be prohibited; use of other substances (provided they are authorized under existing legislation) shall be declared; and the content of any toxic metal shall not be greater than the following % by wt.: Cu 0.001, As 0.00001, Sn 0.01 and Pb 0.0002. [See Sluzbeni List, No. 4, 29 Jan. 1969, Text 36, 150.] VJG

10 D 773
Current food additives legislation - Germany (Federal Republic).
Food and Agriculture Organization
Current Food Additives Legislation 1968 (118) 3 (1968) [En] [Rome, Italy]

The 5th Amendment, dated 3 May 1967, to the Fruit Treatment Order of 19 Dec. 1969 removes the As-free restriction in the permitted use of shellac; includes plum jam amoung products that may be made from fruit pulp treated with sulphite; and brings the listed sulphurous acid salts into line with the EEC Directive on Preservatives. VJG

10 R 357
Analysis of arsenic and selenium in marine raw materials.
Lunde, G.
Journal of the Science of Food and Agriculture 21 (5) 242-47 (1970) [21 ref. En] [Central Inst. for Res., Oslo 3, Norway]

Samples of the flesh, skin and bone of cod, herring, mackerel, Norway haddock, lobster, mussel, clam, oyster, squid and whale were homogenized with distilled water and then boiled. The suspension was filtered and samples of both the filtrate (the water soluble phase or N liquor) and the presscake (the water insoluble phase) were subjected to gel filtration on Sephadex G-25. The presscake was treated with proteolytic enzymes to yield a water soluble fraction prior to passage through the gel. The raw material and fractions of the N liquor and presscake obtained by gel filtration were analysed for arsenic and selenium by neutron activation. Selenium was found to be associated with fractions of mol. wt. over 5000, whereas arsenic was associated with the lower mol. wt. fractions and was possibly present as arseno-organic compounds. Generally the N liquor contains more arsenic than the raw materials. In the case of selenium the N liquor from the fish contained more selenium than the raw material, but this effect was not observed in the invertebrate organisms examined. BFMIRA

12 D 963
[Canned meat, 'Rusensko Vareno'.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 7613-69 4pp. (1970) [Bg] Sofia

This standard, which came into force on 1 July 1970, applies to the canned 'Rusensko Vareno' pig meat dish. Regulations on components, manufacture, appearance and condition of cans and contents, organoleptic properties, composition, sampling, methods of analysis, packaging, labelling, storage, transport and administrative documentation are listed. There is no tolerance for Pb, As and pathogenic or potentially pathogenic micro-organisms. SKK

12 D 964
[Canned fish. Scad in sunflower seed oil.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 481-69 5pp. (1970) [Bg] Sofia

This standard, which replaces BDS 481-51 and came into force on 1 July 1970, applies to canned scad (Trachurus trachurus L.) from summer and autumn catches. Regulations on canning procedure, appearance and condition of cans and contents, organoleptic properties, composition, packaging, labelling, sampling, methods of analysis, storage, transport and administrative documentation are listed for 1st grade and 2nd grade product. There is no tolerance for presence of Pb, As, foreign matter or pathogenic micro-organisms in either grade. Content of aerobic spore-formers should be $\leqslant 10/g$. SKK

VOLUME 3

2 U 68
Specification for sodium alginate, food grade.
India Standards Institution
IS: 5191 10pp. (1969) [En] Price Rs 3.50 [Manak Bhavan, 9 Bahadur AShah Zafar Marg, New Delhi 1, India]

This standard, adopted in July 1969, prescribes the requirements, methods of sampling and tests for sodium alginate for use as a food additive. Aspects covered include description, solubility, identification tests for alginic acid and Na, packing, storage and marking. Compositional requirements are: purity (as $(C_6H_7O_6Na)_n$, % by wt.), 91-106; moisture (% by wt.), max. 20; matter insoluble in water (% by wt.), max. 1.0; viscosity (cP), 30-60; As (mg/kg), max. 3; and Pb (mg/kg), max. 10. Appendices give detailed procedures for determination of purity, moisture, matter insoluble in water, and viscosity. JA

2 U 71
Specification for sodium carboxymethyl cellulose, food grade.
India, Standards Institution

IS: 5306 12pp. (1969) [En] Price Rs 4.00 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in Oct. 1969, prescribes the requirements, methods of sampling and tests for sodium carboxymethyl cellulose (CMC) for use as a food additive. Aspects covered include description, identification, packing, storage and marking. Compositional requirements are: active matter content (% by wt.), min. 99; degree of substitution, max. 0.95; loss on drying at 105°C for 3 h (% by wt.), max. 7; viscosity of a 2% w/w solution (cP), min. 25; As (mg/kg), max. 2; Pb (mg/kg), max. 10; and Fe (mg/kg), max. 100. Appendices give detailed procedures for determination of active matter content, degree of substitution, viscosity, and Fe. JA

2 U 72
Specification for ascorbic acid, food grade.
India, Standards Institution
IS: 5342 7pp. (1969) [En] Price Rs 2.50 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in Oct. 1969, prescribes requirements, methods of sampling and tests for L-ascorbic acid for use as an antioxidant. Aspects covered include description, solubility, identification, specific rotation, pH, packing, storage and marking. Compositional requirements are: purity (as $C_6H_8O_6$, % by wt.), min. 99; loss on drying over H_2SO_4 for 24 h (% by wt.), max. 0.4; sulphated ash (%), max. 0.1; As (mg/kg), max. 3; and Pb (mg/kg) max. 10. An appendix gives detailed procedures for determination of purity and sulphated ash. JA

2 U 73
Specification for butylated hydroxanisole, food grade.
India, Standards Institution
IS: 5343 11pp. (1969) [En] Price Rs 4.00 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in Oct. 1969, prescribes the requirements, methods of sampling and tests for butylated hydroxyanisole (BHA). Aspects covered include description, solubility, identification, packing, storage and marking. Compositional requirements are: purity (as $C_{11}H_{16}O_2$, % by wt.), mn. 98.5; mp, 62-65°C; sulphated ash (% by wt.), max. 0.01; As (mg/kg), max. 3; Pb (mg/kg), max. 10; and Fe (mg/kg), max. 5. Appendices give detailed procedures for determination of purity, mp, sulphated ash, and Fe. JA

2 U 74
Specification for sodium saccharin, food grade.
India, Standards Institution
IS: 5345 9pp. (1969) [En] Price Rs 3.50 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in Oct. 1969, prescribes requirements, methods of sampling and tests for sodium saccharin. Aspects covered include description, solubility, identification, packing, storage and marking. Compositional requirements are: purity (as $C_7H_4NNaO_3S$, % by wt. on DM basis), 98-100.5; moisture (% by wt.), max. 15; must pass the tests for alkalinity, benzoate and salycylate, ammonium compounds, and readily carbonizable substances; As (mg/kg), max. 3; Pb (mg/kg), max. 10; and Se (mg/kg), max. 30. An appendix gives detailed procedures for determination of purity, moisture, alkalinity, benzoate and salicylate, ammonium compounds, readily carbonizable substances, and Se. JA

2 U 108
[Wheat starch.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 453-69 3pp. (1969) [Bg]

This standard, which came into force on 1 July 1970 and replaces BDS 453-59, covers (i) 1st quality (edible) and (ii) 2nd quality wheat starch. Quality and compositional standards for (i) and (ii) respectively include: foreign matter, no tolerance for both; other starches, no tolerance and traces allowed; moisture, $\leqslant$12 and $\leqslant$13%; ash as % DM, $\leqslant$0.3 and $\leqslant$0.7; ash insoluble in 10% HCl as % DM, $\leqslant$ 0.06 and $\leqslant$ 0.1; acidity (°Noiman), $\leqslant$0.8 and (1.0 and $\leqslant$ 1.5 allowed for certain factories); SO_2, $\leqslant$25 and $\leqslant$50 mg/kg; as, Pb, no tolerance for both; Fe, $\leqslant$15 and $\leqslant$15 mg/kg; Cu, $\leqslant$10 and $\leqslant$15 mg/kg; moulds, no tolerance for both; pathogens and potential pathogens, no tolerance for both; other micro-organisms, $\leqslant$500/g for both. Regulations on manufacture, sampling, analysis, packaging, labelling, storage, transport and documentation are listed. SKK

2 U 113
Specification for butylated hydroxytoluene, food grade.
India, Standards Institution
IS: 5344 10pp. (1969) [En] Price Rs 3.50 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in Oct. 1969, prescribes the requirements, methods of sampling and tests for butylated hydroxytoluene (BHT). Aspects covered include description, solubility, identification, packing, storage and marking. Compositional requirements are: purity (as $C_{15}H_{24}O$, % by wt.), min. 99; mp, 69-70°C; sulphated ash (% by wt.), max. 0.01; As (mg/kg), max. 3; Pb (mg/kg), max. 10; and Fe (mg/kg), max. 5. An appendix gives detailed procedures for determination of purity, mp. sulphated ash, and Fe. JA

2 U 161
Specification for coal tar food colour preparations.
India, Standards Institution
IS: 5346 6pp. (1969) [En] Price Rs 2.00 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in Oct. 1969, prescribes requirements, methods of sampling and tests for coal tar food colour preparations. Aspects covered include description, diluents and filling agents, packing and marking. Limits for impurities are: water-insoluble matter (% by wt.), max. 1.0; mixed oxides (% by wt.), max. 1.0; As (ppm), max. 3.0; Pb (ppm), max. 10; and Cu (ppm), max. 10. JA

3 S 252
Value of processed poultry waste as a feed for ruminants.
El-Sabban, F. F.; Bratzler, J. W.; Long, T. A Frear, D. E. H.; Gentry, R. F.
Journal of Animal Science 31 (1) 107-111 (1970) [16 ref En] [St. Univ., University Park, Pennsylvania, USA]

Poultry waste (consisting of excreta, shed feathers, wasted feed and broken eggs) was autoclaved (APW), cooked (CPW) or dried (DPW) and added to rations for feeding trials, being compared to rations containing soybean meal (SBM) or urea. In sheep feeding trials (3 replicates, each using 9 wether lambs) with rations containing SBM, APW and CPW, results showed no difference in apparent digestibility between rations, protein digestibility was highest for SBM, urinary energy was highest for SBM, and faecal N was lowest for SBM. 25 Angus steers (~301 kg in wt.) were used for a 139-day feeding trial using rations containing SBM, APW, DPW and urea. Those fed urea had a significantly higher (<0.05) average daily gain than those on DPW. Carcass characteristics (marbling, texture, firmness, colour, grade, loin eye area, backfat thickness, kidney knob, Warner-Bratzler shear) and meat acceptability (tenderness, flavour and juiciness) were not significantly different for steers fed the different rations. Average levels of chlorinated hydrocarbon compounds (DDT, DDE, TDE and Endrin) in the backfat and As in the liver of steers fed rations SBM, APW, DPW and urea were well below 1 ppm; the urea ration give the highest level of DDT (0.20 ppm) and DPW a higher ($P<0.05$) As level (0.38 ppm) than other rations. AL

5 A 185
Determination of total arsenic in total diet samples.
Hundley, H. K.; Underwood, J. C.
Journal of the Association of Official Analytical Chemists 53 (6) 1176-78 (1970) [9 ref. En] [FDA, 1009 Cherry St., Kansas City, Missouri 64106, USA]

A simple, sensitive, and reproducible procedure has been investigated for the determination of total As in composite food samples. Samples are dry ashed in the presence of magnesium oxide and magnesium nitrate, and As is evolved from an acid solution as its hydride. The arsine is reacted with silver diethyldithiocarbamate to give a red complex that is measured photometrically. The absorbance of this complex is proportional to arsenic over a wide range of concn. (1-20 μg arsenic). The method presented is sensitive to 0.05 ppm (1 μg/20 g product). AS

5 C 80
[Phytoplanktotoxins in drinking, non-drinking and bathing water.] Phytoplanktotoxine in Trink-, Brauch- und Badewasser.
Vogler, G.
Naturwissenschaftliche Rundschau 23 (7) 291-94 (1970) [6 ref. De] [Hygiene Inst., Leipzig, E. Germany]

The effects on man and animals of toxins produced by some species of phytoplankton are discussed. The toxins gain entry to the body via contaminated water, fish and molluscs, and by bathing in contaminated water. A table lists 20 spp. of toxigenic phytoplankton and their effects on man and animals. Methods for preventing massive development of toxic phytoplankton are critically examined, e.g. use of algicides, removal of nutrients from waste water and use of these nutrients for cultivation of non-toxic algae to be used as animal feed. The danger of these methods, which may lead to the consumption of toxic levels of heavy metals (Cu, As) or algicides accumulated in food during passage through food chains, are emphasized. RM

5 H 708
[Concentration of lead, fluorine and arsenic in Chilean and French wines.]
Torres Montalketti, E.
Anales de la Facultad de Quimica y Farmacia, Universidad de Chile 20: 169-71 (1968) [17 ref. Es, en] [Catedra de Bromatologia, Univ., Santiago, Chile]

Concn. of Pb by polarography, F by colorimetry and As by Cribier's method were determined in 30 Chilean (17 red and 13 white) and 31 French (17 red, 12 white and 2 rose) wines. Wide variations (36-500 μg/l.) were found in Pb contents; F concn. in Chilean wines were generally less than in French wines (0.44-0.63 vs. 0.60-1.10 mg/l.); F concn. in both cases was <17 μg/l. Levels of these elements found were considered to offer no health hazard. MIdeM

5 U 279
[Vermouth.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 909-69 4pp. (1970) [Bg]

This standard, which came into force of 1 July 1970 and replaces BDS 909-52, deals with 7 varieties of white and red vermouth made from white wine by addition of alcohol, sugar, vermouth infusion, tartaric or citric acid and caramel. It contains regulations on quality of materials and on characteristics, compositional standards, packaging, labelling, sampling, analysis, storage, transport and official documentation of vermouths. Standards include: alcohol content (vol. %), 16-18 depending on variety; sugar content (as invert sugar), 15-20% depending on variety; titratable

cidity as tartaric acid, 3.5-6.0g/l. (all arieties); volatile acids, as acetic acid, ⩽1.0 /l. (all varieties); SO_2 content, total ⩽200 ng/l. free 20 mg/l. (all varieties); other reservatives, no tolerance; artificial olorants, no tolerance; Fe content, 8 mg/l. (all arieties); Cu content, 3 mg/l. (all varieties); s, Pb, Zn, no tolerance. SKK

U 281
Cabernet wine.]
ulgaria, Vurkhoven Suvèt po Standartizatsiya ulgarian Standard BDS 7930-70 2pp. (1970) [Bg]
This standard, which came into force on 1 Sept. 970, deals with red table wine from Cabernet auvignon grapes. It contains regulations on inemaking and characteristics, compositional tandards, sampling, analysis, packaging, belling and official documentation of the wine. tandards include: alcohol content, ⩾11.5 vol.%; ugar content, as invert sugar, ⩽5 g/l.; tratable acidity, as acetic acid, ⩽1.5 g/l.; ugar-free extract content, ⩾24 g/l.; SO_2 content, otal ⩽200 mg/l., free ⩽20 mg/l.; Fe content, ⩽10 ng/l.; Cu content, ⩽3 mg/l.; Pb, As contents, no olerance; artificial colorants, not permitted. SKK

U 301
Fruit jams.]
olombia, Instituto Colombiano de Normas Tecnicas CONTEC 285 4pp. (1969) [Es] [Apartado Aereo 4237, Bogota 2, Colombia]
This standard, issued in May 1969, deals with ruit jams. It contains regulations on definitions nd designations, quality requirements, sampling, ackaging and labelling. Composition standards nclude: min. fruit content for strawberry, pear, lum, pineapple, peach, apple, lulo (Solanum uitoense), tree-tomato (Cyphomandra betacea endt.) and mango jams is 45%, for agraz Vaccinium meridiomale SW.), apricot, blackberry nd guava jams it is 40%, and for seville orange nd sweet orange marmalades it is 30%; artificial olouring, no tolerance except for strawberry jam or which amaranth, erythrosine and Poncean SX are ermitted; artifical aroma substances, no olerance; antioxidants, ascorbic acid permitted; reservatives, sodium benzoate (max., 0.1%) and otassium sorbate (max., 0.125%) permitted; total oluble solids content, ⩾65%; Cu, ⩽10 ppm; Pb, ⩽2 pm; As, ⩽0.1 ppm. SKK

U 306
Dairy products. Determination of heavy metals: rsenic.]
Roumania, Directia Generala pentru Metrologie, tandarde si Inventii
Roumanian Standard STAS 8342/6-69 4pp. (1970) [Ro]
This standard, which came into force on July 1, 970, specifies apparatus, reagents and rocedure to be used for determination, by eduction and colour reaction using $HgCl_2$ aper, of As in dried milk, conc. milk products nd cheese. Sensitivity of the method is 0.25 μg s. HBr

6 J 741
Arsenic residue toxicity to vegetable crops grown on Slainfield sand.
Jacobs, L. W.; Keeney, D. R.; Walsh, L. M.
Agronomy Journal 62 (5) 588-91 (1970) [14 ref. En] [Dept. of Soils, Univ., Madison, Wisconsin, 53706, USA]
In a field trial at the University of Wisconsin Experimental Station, Hancock, sodium arsenite, used widely as a defoliant for potatoes, was applied to a Plainfield sand at rates ranging from 45 to 720 kg As/ha. Plots were planted to potatoes 1967; peas, snap beans, and sweet corn 1968; and peas 1969. Yields generally decreased with increasing As, with no growth at high As. As content of above-ground portion of potatoes varied widely, with no relation to As treatment; further there was evidence of As contamination by windblown As-treated soil. ⩽0.5 ppm As accumulated in potato tubers, ⩽84 ppm in potato peelings, and ⩽1 ppm As in snap bean seeds and pods. With Plainfield sand, yield reduction of peas and snap beans and sweet corn occurs at ~10, 1 and 5 ppm of total, ammonium acetate or Bray P-1 extractable As, respectively.
Hence As as a potato vine defoliant on sandy soils should be discouraged. GLS

6 U 393
Current food additives legislation - Malta.
Food & Agriculture Organization
Current Food Additives Legislation 1968 (120) 10 (1968) [En] [Rome, Italy]
The Canned Tomatoes Standard Order (1968), states that the content of Ca ions in canned tomatoes should be ⩽0.026% of can contents and the addition of NaCl and seasoning and flavouring agents in small amounts is permitted (Ca to be determined by the Official Methods of Analysis of the AOAC). Canned tomatoes should not contain Cu, Pb or As in excess of prescribed limits as published in Standard Order No. 1 of 1967. AB

6 U 399
Current food additives legislation - Netherlands.
Food & Agriculture Organization
Current Food Additives Legislation 1969 (124) 10 (1969) [En] [Rome, Italy]
Definitions, identity standards and labelling rules for salt, kitchen salt, table salt and nitrite brine are issued in the Decree of 16 July 1968 on Salt. Authorized additives for incorporation in salt are listed. The only harmful ingredients tolerated in salt are As (max. 1 mg kg), Pb (max. 0.1 mg/kg) and Cu (max. 0.5 mg/kg). AB

6 U 431
Current food additives legislation - South Africa.
Food & Agriculture Organization
Current Food Additives Legislation 1969 (129) 18-19 (1969) [En] [Rome, Italy]
Government Notice No. 3228 of 5 Sept., 1969 amends Reg. 3 (2) under the Food, Drugs and Disinfectants Act, No. 13 of 1929. Tolerances for As, Cu, Pb, Zn and Sn in certain beverages and various fruit derivatives such as cordials, syrups, squashes, juices and purees are tabulated. AB

7 A 264
[Determination of microquantities of arsenic in foods.]
Caton, L.; Alexandru, R.; Tarabas, C.
Lucrarile Stiintifice. Institutul Politehnic Galati 4: 81-91 (1970) [30 ref. Ro, fr, de]

A colorimetric method for determination of As^{+} in foods is described. As is eliminated from the test samples (which are first mineralized with conc. H_2SO_4 and H_2O_2) in the form of AsH_3 by use of Zn and dilute H_2SO_4. The AsH_3 is captured in 0.1N $KMnO_4$ solution and oxidized to As^{5+}; excess $KMnO_4$ is reduced with 0.1N oxalic acid solution. pH must be kept within the 0.7-1.0 range during the colorimetric analyses. Results are reproducible (analytical error approx. ± 2%). The method is said to be very sensitive. HBr

7 A 277
Environmental researches at the Laboratory of the Government Chemist.
Lewis, D. T.
Laboratory Practice 20 (1) 24-30 (1971) [29 ref. En, fr, de] [Gov. Chemist's Lab., Cornwall House, London SE1, UK]

The Lab. of the Government Chemist is concerned with quality control of foods, drugs, agricultural products, etc. and carries out numerous analytical investigations relating to the quantitative determination of various additives or contaminants in these groups of industrial manufactures. These activities are described under the following headings: food and environment, covering contamination of food and water with poisonous elements (e.g. Pb, As, Hg) and organochlorine and organophosphorus pesticides; natural food contaminants (e.g. aflatoxins); the chemistry of waters and effluents; fluoridation of water supplies; fission product and radionuclide studies; radon-222; and toxic substances in factory atmospheres. A table lists atmospheric contaminants of factories, threshold limits and methods of estimation. JA

8 U 568
Specification for liquid glucose.
India, Standards Institution
IS: 873-1956 Amendment No.2 1p. (1970) [En] [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

Standard IS: 873-1956 gave the requirements for sampling liquid glucose. Descriptions were given of apparatus and methods used in the determination of: colour moisture content, reducing sugars, sulphated ash, pH, SO_2, As, Pb, Cu, Zn, Sn, and Fe. This Amendment (No. 2) to the original standard requires that for the 3 grades low, medium and high conversion liquid glucose, the max. sulphated ash content (% by wt.) be changed from 0.6 to 0.50 and the max. SO_2 content (ppm) be changed from 450 to 400. A new clause stating that each container may also be marked with the Indian Standards Institution Certificate Mark should be included. VJG

9 U 613
[Jam.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 689-70 5pp. (1970) [Bg]

This standard, which replaces BDS 689-51, came into force on Sept. 1, 1970. Jams shall have ≥69% DM, ≥60% sugar (as invert sugar), 0.3-1.3 acidity (as tartaric acid), ≤10 mg Cu, ≤100 mg Sn, ≤0.4 mg As, ≤0.5 mg Pb, ≤5 mg Zn, and 10 mg F (all /kg, in terms of salts). The standard also covers requirements for taste, colour, odour, appearance, packaging, labelling, sampling, testing, storage, transport and documentation. HBr

9 U 619
[Pasteurized, canned meat, 'Hunter' style.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 7908-70 4pp. (1970) [Bg]

This standard, which came into force on July 1, 1970, applies to canned, pasteurized 'Hunter'-style meat, made from beef, pork, bacon and seasoning. The product shall have ≤65% moisture, ≤45% fat in DM, ≤2% cooking salt, ≤20 mg Na/100 g and ≤200 mg Sn/kg; there is no tolerance for Pb or As. The standard covers can requirements, product appearance, taste and colour, sampling, testing, packaging, labelling, documentation, storage, shelf-life and transport. HBr

9 U 620
[Pasteurized, canned meat, 'Tourist' style.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 7909-70 4pp. (1970) [Bg]

This standard, which came into force on July 1, 1970, applies to canned, pasteurized 'Tourist'-style meat made from beef, pork, bacon and seasoning. The product shall have ≤65% moisture, ≤35% fat in DM, ≤2% cooking salt, ≤20 mg Na/100 g and ≤200 mg Sn/kg; there is no tolerance for Pb or As. The standard covers can requirements, product appearance, taste and colour, sampling, testing, packaging, labelling, documentation, storage, shelf-life and transport. HBr

9 U 697
Health laws and regulations - South Africa.
World Health Organization
International Digest of Health Legislation 21 (3) 611-32 (1970) [En] [Geneva, Switzerland]

A selection of South African health laws and regulations is given, including the following which relate to food hygiene: Government Notice No. 3228 of 5 Sept., 1969 amends regulations made under Section 42 of the Food, Drugs and Disinfectants Act, No. 13 of 1929 (tolerance limits (ppm) of As, Cu, Pb, Sn and Zn in certain foods and beverages are listed); Standing regulations under the Animal Slaughter, Meat and Animal Products Hygiene Act 1967 issued in Government Notice No. R. 3505 of 9 Oct. 1969 (provisions relate to abattoir requirements and hygiene, handling, slaughter and inspection, ante- and post-mortem inspections, marks and marking, and equine animal and poultry slaughter regulations). VJG

10 U 756
[Modern analytical methods.] Über moderne Analysen-Methoden.
Anon.
Allgemeine Fischwirtschaftszeitung 23 (9) 24 (1971) [De]
A report is given of the 6th Conference of the FAO/WHO Codex Committee on analytical methods held in Bonn-Bad Godesberg in Jan. 1971, to evaluate international reference methods for all foods, additives and foreign matter. This included fats, oils, mushroom, fruit, vegetables, deep-frozen products, honey, chocolate, fruit juices, dietary foods, preservatives, antioxidants, colouring substances and metallic contaminants. Methods of estimation of CO_2, sorbic acid, benzoic acid, PHB-ester, formic acid, hexamethylenetetramine, salicylic acid and boric acid, Hg, Pb, As, Cd, Cu, and Zn were discussed. OA

11 C 209
Arsenic and water pollution hazard.
Scott Pattison, E.
Science 170 (3960) 870 (1970) [2 ref. En] [Soap & Detergent Assoc., 475 Park Avenue S., New York 10016, USA]
The likelihood of As pollution of drinking water supplies as an indirect effect of the use of arsenates in detergents is briefly discussed. It is claimed that the trace amounts of As in detergent preparations are well below those naturally present in many foods, particularly fish and other seafoods. Moreover As in detergents is present as the non-toxic, rapidly excreted pentavalent arsenate, not as the toxic trivalent arsenite. AB

11 U 806
[Sugar products: determination of As content.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 7929-70 5pp. (1970) [Bg]
This standard, which partly replaces BDS 1554-53, deals with As determination in sugar products by the Gutzeit method using mercuric chloride. It contains regulations on apparatus, equipment, chemicals, reagents, preparation of sample, analytical procedure and calculation of results. The accuracy of the determination is given as ± 10%. SKK

11 U 812
Golden syrup and treacle.
Standards Association of Central Africa
Central African Standard CAS No. S29:1970 11pp. (1970) [En] Price $0.50. [PO Box 2259, Salisbury, Rhodesia]
This specification covers manufacturing conditions and analytical and microbiological requirements for the production of golden syrup and treacle. Compositional requirements of golden syrup and treacle respectively are: TS (% m/m), 83.0-86.0 and 83.0-86.0; total sugars (as invert, % m/m) 79.0-83.0 and ⩽86.0; reducing sugar (as invert, % m/m), 47.0-50.0 and - ; molasses (% m/m), - and 40.0-60.0; sulphated ash (% m/m), 1.7 and 1.7; SO_2 (mg/kg max.) 70 and 70; As (mg/kg max.), 1 and 1; Pb (mg/kg max.), 2 and 2; Cu (mg/kg max.), 10 and 10; Fe (mg/kg max.), 10 and 10. No artificial colouring may be used, golden syrup must be clear and free from haze, the products must be packed in hermetically sealed tin plate or glass containers. These containers must bear labels showing name and true description of product, name and full business address of canner or person for whom the product has been manufactured, net mass, date of canning and certification mark of the Standards Association of Central Africa. An appendix gives the physical test methods and methods of chemical analysis for the above constituents. VJG

11 U 814
[Sterilized stewed paprika.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 1461-70 4pp. (1970) [Bg]
This standard, which came into force on 1 Jan. 1971 and replaces BDS 1461-53, deals with sliced green, yellow or reddish paprika stewed with ripe tomatoes, packaged in slightly salty tomato juice in cans or glass jars and sterilized. It contains regulations on quality requirements, composition, packaging and labelling, sampling, analysis, storage and transport. Compositional standards include: Cu content, ⩽10 mg/kg; Sn content, ⩽50 mg/kg (jars) or ⩽100 mg/kg (cans); Pb content, ⩽0.3 mg/kg; Zn content, ⩽10 mg/kg; Fe content, ⩽15 mg/kg; As content, ⩽0.2 mg/kg; pathogenic microorganisms, no tolerance. SKK

11 U 815
[Tomato juice.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 3045-70 3pp. (1970) [Bg]
This standard, which came into force in 1 Jan. 1971 and replaces BDS 3045-57, deals with tomato juice from fresh ripe tomatoes, with or without salt or sugar, packaged in cans or glass bottles and preserved by physical means without application of ionizing radiations. It contains regulations on quality requirements, composition, packaging, labelling, sampling, analysis, transport and official documentation. Compositional standards for 1st and 2nd quality products include: foreign matter, no tolerance; salt ⩽0.5%; acidity (as citric acid), ⩽0.6%; ascorbic acid content (storage for ⩽6 months), ⩾100 mg/kg (1st quality) and ⩾70 mg/kg (2nd quality); Sn content, ⩽10 mg/kg (bottles) and ⩽100 mg/kg (cans); Cu content, ⩽5 mg/kg; Fe content, ⩽15 mg/kg; Pb content, ⩽0.3 mg/kg; As content, ⩽0.2 mg/kg; pathogenic microorganisms, no tolerance; preserving substances and colouring matter, no tolerance; storage life, ⩽1 yr at ⩽18°C. SKK

11 U 820
[Dessert fruit wines.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 8108-70 3pp. (1970) [Bg]
This standard, which came into force on 1 Jan. 1971, deals with dessert fruit wines of high alcoholic strength and sugar content produced by complete or partial fermentation of fruit pulp or juice with the addition of water, sugar and grape wine. It contains regulations on quality, composition, organoleptic requirements, sampling, analysis, packaging, labelling, storage, transport

and official documentation. Standards for raspberry, blackberry, blackcurrant, strawberry and blueberry wines include: alcohol content, 15-16 vol. %; sugar as invert sugar, 15-16%; sugar-free extract, ⩾16 g/l.; titratable acidity as malic acid, 6-9 g/l.; volatile acidity as acetic acid, ⩽1.5 g/L; total SO_2, ⩽200 mg/l.; free SO_2, ⩽15 g/l.; Cu, ⩽3 mg/l.; Fe, ⩽8 mg/l.; Pb, As and Zn, no tolerance; synthetic organic dyes, no tolerance. SKK

11 U 832
Specification for agar, food grade.
India, Standards Institution
Indian Standard IS:5707-1970 7pp. (1970) [En]
Price Rs 2.50. [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard prescribes requirements and methods of test for food grade agar, i.e. the dried hydrophilic colloidal polygalactoside extracted from red algae (class Rhodophyceae), such as Gelidiella and Gracilaria spp. Agar must be commercially available in bundles consisting of thin, membranous strips or in cut, flaked, granulated or powdered forms; white or pale yellow in colour; odourless or have slight odour and mucilaginous taste; and insoluble in cold water but soluble in boiling water. Compositional requirements are: moisture (% by wt. on drying at 105°C for 5 h), 20; total ash (max. % by wt.), 6.5; acid-insoluble ash (max. % by wt.), 1.0; insoluble matter (max. % by wt.), 1; As (max. mg/kg), 3; Pb (max. mg/kg), 10. Agar must pass test for water absorption, gelatin and starch and dextrins. Packaging and marking, and sampling are also considered. Methods for determining water absorbed, total ash, acid-insoluble ash, gelatin, insoluble matter and starch and dextrins are appended. VJG

11 U 858
[Citric acid for food purposes.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 8142-70 10pp. (1970) [Bg]

This standard, which came into force on 1 July 1971, deals with citric acid for food purposes obtained by oxidative sugar fermentation in molases using Aspergillus niger. It contains regulations on technical requirements, sampling, analytical methods, packaging, labelling, storage, transport and official documentation. Standards include: citric acid content ⩾98.5%; ash, ⩽0.5%; free H_2SO_4, ⩽0.05%; As content, ⩽0.00007%; heavy metal content (sulphide test), ⩽0.0033 mg Pb equivalent/g. SKK

12 H 1757
The estimation of arsenic in beer and malt.
Martin, P. A. (United Kingdom, Institute of Brewing, Analysis Committee)
Journal of the Institute of Brewing 77 (4) 365-368 (1971) [9 ref. En]

The Gutzeit and silver diethyldithiocarbamate procedures for the determination of As have been collaboratively studied and the Gutzeit procedure is recommended. Determinations may be carried out directly on beers or on acid extracts of unground malt. AS

12 U 914
Specification for lecithin, food grade.
India, Standards Institution
Indian Standard IS: 5055 13pp. (1969) [En]
Price Rs 5.00 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in April 1969, prescribes the requirements and methods of sampling and test for lecithin for use as a food additive. Aspects covered include description, solubility, identification tests, gossypol content, packing and marking, sampling and tests. Compositional requirements are: purity (as acetone-insoluble residue, % by wt., min.), 50; moisture (% by wt., max.), 2; P (% by wt., min.), 3.5; benzene insoluble matter (% by wt., max.), 0.3; acid value (max.), 36; As (mg/kg, max.), 3; and Pb (mg/kg, max.), 10. Appendices give detailed procedures for determination of total gossypol, purity, moisture, P, benzene insoluble matter and acid value. JA

12 U 917
Specification for potassium nitrite, food grade.
India, Standards Institution
Indian Standard IS: 5057 6pp. (1969) [En] Price Rs 2.00 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in April 1969, prescribes the requirements and methods of sampling and test for potassium nitrite for use as a food preservative. Aspects covered include description, solubility, identification tests, packing, storage and marking, sampling and tests. Compositional requirements are: purity (on dry basis, % by wt., min.), 97; loss on drying when dried over silica gel for 4 h (% by wt., max.), 1; As (mg/kg, max.), 3; and Pb (mg/kg, max.), 10. An appendix gives a detailed procedure for determination of purity. JA

12 U 918
Specification for sodium citrate, food grade.
India, Standards Institution
Indian Standard IS: 5058 7pp. (1969) [En] Price Rs 2.50 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, adopted in April 1969, prescribes the requirements and methods of sampling and test for sodium citrate for use as a food preservative. Aspects covered include description, solubility, identification tests, oxalate test, readily carbonizable substances test, packing, storage and marking, sampling and test. Compositional requirements are: purity (on dry basis, % by wt., min.), 99; moisture (% by wt., max.), anhydrous 1, dihydrate 13; must pass the alkalinity test; As (on dry basis, mg/kg, max.), 3; and Pb (on dry basis, mg/kg, max.), 10. Appendices give detailed procedures for determination of purity and moisture and for the alkalinity test. JA

2 U 930
Orange juice.]
Kuwait, Ministry of Commerce and Industry, Department of Industrial Affairs, Standardization and Metrology
Kuwait Standard KSS 2/1970 3pp. (1970) [Ar]
This standard, which applies to natural orange juice, conc. orange juice and orange beverages, establishes max. contents of deleterious elements, such as As (≤0.1 ppm), Pb (≤2 ppm), Cu (≤10 ppm) and Zn (≤300 ppm), min. solids contents and acid content range. Natural orange juice shall not contain colouring agents, artifical sweeteners or preservatives. Pasteurized or conc. orange juice may contain preservatives, colouring agents or taste improvers within certain limits. Can requirements, labelling and transport of frozen juices (which must be sold within 6 months of processing) are also covered. JKM

2 U 939
Edible starch.]
Kuwait, Ministry of Commerce and Industry, Department of Industrial Affairs, Standardization and Metrology
Kuwait Standard KSS 6/1970 3pp. (1970) [Ar]
The standard applies to edible starch derived from rice, wheat, potatoes and sweet potatoes. The natural characteristics of the product, which shall be free from fungi or harmful elements such as Pb or As, must be retained. Packaging and labelling requirements are listed. JKM

VOLUME 4

S 32
Arsenical compositions. Control of meat in abattoirs.]
Catellani, G.; Faccini, G.; Splendiani, F.
Courrier des Abattoirs 12 (66) 31-37 (1971) [18 ref. Fr] [Fac. de Med. Vet., Univ. de Naples, Italy]
As is often used in the production of meat as a stimulent, growth promoter, antibiotic and prophylatic for animals. Rapid methods for the determination of As in freshly slaughtered meat are briefly reviewed. The preferred method uses a pyridine solution of Ag diethyldithiocarbamate. A 10-g sample is incinerated with 3 g MgO and 6 g cellulose powder, and then reheated with 3 g $Mg(NO_3)_2.6H_2O$ at 550°C and then dissolved in 90 ml 3N HCl + 85 ml H_2O. 2 ml 15% KI solution is added, followed by 1 ml 40% $SnCl_2$ in conc. HCl and refrigeration for 30 min. 10 g Zn is added, followed by 3 ml Ag diethyldithiocarbamate solution in pyridine, and the colour measured spectrophotometrically at 560 mm. 0.5-20 μg As are detectable. JN

S 41
A survey of the arsenic, copper and lead contents of pig and other animal livers.
Reden, J. D.
Journal of the Association of Public Analysts 8 (1) 14-19 (1971) [6 ref. En] [County Analyst's Lab., County Hall, Taunton, Somerset, UK]
120 random samples of liver were examined for As, Cu and Pb. <0.1 ppm of As was found in 104 samples, <1.0 ppm (0.1-0.9 ppm) in 11 samples and 5 contained >1.0 ppm. Cu content of edible livers was: 98 samples, 0-20 ppm; 30, 20-50 ppm; 5, 5-100 ppm; 2, >100 ppm. Pb content was: 134 samples, 0-0.2 ppm; 1 sample, >2.0 ppm. The max. limit for As in foods intended for human consumption is fixed at 1.0 ppm. Levels of Cu >50 ppm are regarded as excessive. 1 sample was found to contain Pb in excess of the limit of 2.0 ppm laid down in the food regulations. VJG

2 C 40
Source and occurrence of environmental contaminants. [A review]
Somers, E., Smith, D. M.
Food and Cosmetics Toxicology 9 (2) 185-193 (1971) [47 ref. En] [Food and Drug Directorate, Iunney's Pasture, Ottawa 3, Ontario, Canada]
Sources and occurrence of the following food contaminants: trace elements (Pb, Cd, Hg and As); pesticides; polychlorinated biphenyls; and chlorodioxins, are reviewed. VJG

2 R 63
Report of a survey of fish products for metallic contamination undertaken in South West England and South Wales during early 1971.
Taylor. D. J.
Journal of the Association of Public Analysts 9 (3) 76-85 (1971) [2 ref. En] [Scientific Adviser's Dept., Canynge Hall, Bristol, BS8 2PR, UK]
This synopsis of a paper read at the Annual General Meeting of the Association of Public Analysts at Matlock, May 1971, reports work carried out by 8 Public Analysts' Laboratories in the South West in a collaborative study of metallic contamination of fish products. 209 fish products (including 48 samples of tuna fish) were examined for Hg, methyl mercury, As, Cd, Cu, Zn and Pb. The following ranges were obtained (ppm): Hg, 0.1-0.9; As, <0.5-20; Cd, 0-6; Cu, 0-50; Zn, 0-50; Pb, 0-5. Tuna fish levels (ppm) were: Hg, 0.1-0.8, mean level 0.3; As, <0.5; Cd, <0.2; Cu, <3; Zn, <20; Pb, <1.3. Most of the Hg was in the form of methyl mercury compounds. VJG

2 U 100
Specification for calcium saccharin, food grade.
India, Standards Institution
Indian Standard IS: 5709-1970 8pp. (1970) [En]
Price Rs. 2.50 [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]
This standard, adopted in July 1970, prescribes the requirements and methods of sampling and test for food grade calcium saccharin. Requirements cover solubility in water, identification, composition, packaging, storage and marking, sampling and tests. Compositional requirements are: purity (as $C_{14}H_8CaN_2O_6S_2$, on dry basis, % by wt.), ≥95; moisture (% by wt.), ≤15; readily carbonizable substances, to pass prescribed test; benzoate and salicylate, to pass prescribed test; As (mg/kg), ≤3; Pb (mg/kg), ≤10; Se (mg/kg), ≤30. Appendices detail methods for determination of purity, moisture and Se, and tests for readily carbonizable substances and benzoate and salicylate JA

2 U 108
Specfication for lactose, commercial.
India, Standards Institution
Indian Standard IS: 1000-1959 Amendment No. 1 1pp. (1971) [En] [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This amendment, issued in Feb. 1971, to the standard adopted in 1959, adds the following new clause: '3.1.1 The product [lactose] shall be processed and packed in premises maintained under hygienic conditions. It shall also be stored and distributed under hygienic conditions.' The original standard prescribes the requirements and methods of test for commercial lactose. Requirements cover particle size, composition, quality of test reagents, packing and marking. Appendices detail methods for: sampling of lactose, testing for acidity, and determining total ash, fat, N, lactose, specific rotation, Pb and As. JA

4 N 199
Activation analysis of trace elements in lipids with emphasis on marine oils.
Lunde, G.
Journal of the American Oil Chemists' Society **48** (10) 517-522 (1971) [6 ref. En] [Central Inst. for Ind. Res., Forskningsvn. 1, Oslo 3, Norway]

A short introduction to activation analysis is given where some of the main features of the method, especially when applied to biological material, are described. The following trace elements were analysed in marine and vegetable oils: As, Br, Na, Cu, Mn, Zn, Ni and Fe. Both As and Br were present as organic compounds. The As was removed in the alkali refining process. The distribution of trace elements in oils has been studied by use of autoradiography and γ-spectroscopy. The results indicate that this distribution is dependent on the phospholipid content in the oil. A high phospholipid content seems to give a more homogeneous distribution of inorganic trace elements. AS

4 R 156
Preliminary survey of heavy metal contamination of Canadian freshwater fish.
Uthe, J. F.; Bligh, E. G.
Journal of the Fisheries Research Board of Canada **28** (5) 786-788 (1971) [8 ref. En] [Fisheries Res. Board, Freshwater Inst., Winnipeg 19, Manitoba, Canada]

The concn. of Pb, Ni, As, Cu, Sb, Cd, Zn, U, Hg, Mn, Se, Cr and Sn in lake whitefish (i) and northern pike (ii) from Moose Lake, in (i) from Lake Ontario, in (ii) from Lake St. Pierre and Lake Erie, and in rainbow smelt and yellow perch from Lake Erie are given. With the exception of Hg, the levels were within regulatory limits and did not differ significantly between industrial and non-industrial areas. JN

4 S 501
[Contamination of edible meat with arsenical compounds.]
Splendiani, F.; Pesino, L.
Zooprofilassi **26** (9/10) 317-331 (1971) [It] [Cattedra di Ispezione degli Alimenti di origine animale, Fac. di Vet., Univ., Naples, Italy]

Levels of As in the liver, kidney, muscle and skin of chickens and pigs following growth-promoting or therapeutic treatments with organic arsenicals are reported. Normal levels in 90-day old chickens varied from 0.04-0.14 ppm in areas of low pollution to 0.69-0.84 ppm in industrial areas. Treatments caused short-term accumulation of As, particularly in the liver and kidneys (up to 13 ppm) with return to normal levels within 7 days (chickens) and 17-20 days (pigs). The more permanent increase in the As content observed in hog bristle (0.29-0.80 ppm before, to 1.7-6.6 ppm after treatment) could be used as indicator of previous ingestion of arsenicals. Results obtained on market samples (16 samples of poultry feed, 6 of pig feed, and liver or kidneys from 51 pigs, 90 chickens and 13 turkeys) are also reported. The max. As content of the feed samples was 0.55 ppm, and of the pig samples, 0.05 ppm, but 17 of the chicken and 4 of the turkey samples contained high levels (1-4 ppm). Urgent control of the use of arsenical growth-promotors, and the establishment of a waiting period of 20 days between cessation of treatment and slaughter of pigs is advocated. ECA

5 C 121
An assessment of some public health problems resulting from feeding poultry litter to animals. Microbiological and chemical parameters.
Messer, J. W.; Lovett, J.; Murthy, G. K.; Wehby, A. J.; Schafer, M. L.; Read, R. B., Jr.
Poultry Science **50** (3) 874-881 (1971) [14 ref. En] [US Dept. of Health, Education, and Welfare, Public Health Service, Bureau of Foods, FDA, Div. of Microbiol., Cincinnati, Ohio 45226, USA]

Feeding of poultry litter to cattle, sheep, and swine has opened many questions of public health significance. The present study was designed to examine whether heat resistance of salmonellae and Arizona pathogens in poultry litter was similar to that expected for wet or dry heat; whether heat treatment of poultry litter would provide an effective barrier against disease transmission; and to determine levels of some medicinals, pesticides, and UV light-activatable compounds in poultry litter. Results demonstrated that salmonellae and Arizona sp. are not highly resistant to heat in poultry litter of normal moisture content. Thus a heat process for their elimination may be feasible. The fact that salmonellae are more resistant to moist heat, however, than are Escherichia coli eliminates use of E. coli as an indicator of efficiency of heating. With the exception of As, the concn. of pesticides and medicinals present in litters assayed were low. It is possible that levels higher than those reported might be present in poultry litter. This possibility and the unknown effect of continuous

exposure to low levels of pesticides and medicinals suggest that the present ban on USA interstate shipment of poultry litter for animal feed is warranted. AS

5 C 126
Environmental research in toxic metals and pesticides.
Lisk, D. J.
New York's Food and Life Sciences 4 (4) 15-17 (1971) [15 ref. En] [Dept. of Entomology, Cornell Univ. Agric. Expt. Sta., Ithaca, New York, USA]

This review-type article discusses recent and current studies, initiated by the Pesticide Residue Laboratory (Ithaca, New York, USA), on the fate of toxic metals and pesticides in the environment. Studies and results outlined are: Hg, methylmercury, As and Pb in fish; Hg in Japanese quail; Cu and Ag compounds for control of algae; and DDT in fish. JA

5 C 128
Mercury in food.
Anon.
British Food Journal 74 (846) 5 & 8 (1972) [En]

2 recent surveys of Hg contamination of food are discussed. Mean levels were 0.19 ppm in canned tuna fish, 0.08 ppm in canned salmon, 0.07 ppm in fresh and canned shellfish and crustaceans, 0.06 ppm in other canned fish and 0.06 ppm in fresh white fish. Levels in small samples of other foods were generally low, but showed a wide range. Tuna fish was seen to be the only product appreciably contaminated, ~80% of the Hg being in the form of methyl mercury compounds. Arsenical contamination of fish ranged from 0.5 to 20 ppm, the majority containing <1.2 ppm; cadmium contamination was in the range 0-6 ppm with levels generally <1.2 ppm; copper 0-50 ppm; zinc 0-50 ppm; and lead 0-5 ppm. Levels of heavy metals in tuna fish apart from Hg were low. PG

5 R 246
Concentrations of trace elements in Great Lakes fishes.
Lucas, H. F., Jr.; Edgington, D. N.; Colby, P. J.
Journal of the Fisheries Research Board of Canada 27 (4) 677-684 (1970) [12 ref. En] [Radiological Physics Div., Nat. Lab., Argonne, Illinois 60439, USA]

Concn. of 15 trace elements was determined by activation analysis of samples of whole fish (alewives, spottail shiners and trout-perch) and fish livers from 3 of the Great Lakes: Michigan, Superior and Erie. Average concn. of 7 elements in 19 whole fish from the species were as follows: U, 3 ppb (parts per billion); Th, 6 ppb; Co, 28 ppb; Cd, 94 ppb; As, 16 ppb; Cr, 1 ppm; and Cu, 1.3 ppm. Average concn. of 8 elements in 40 liver samples from 10 spp. of fish were as follows: U, ~2 ppb; Th, ≤2 ppb; Co, 40 ppb; Cu, 9 ppm; Zn, 30 ppm; Br, 0.4 ppm; As, 30 ppb; and Cd, 0.4 ppm. Other elements observed in most of the samples were: Sb, 5-100 ppb; Au, 2-5 ppb; La, 1-20 ppb; Re, 0.5-5 ppb; Rb, 0.06-4 ppm; and Se, 0.1-2 ppb. Trace element concn. varied with species and lake. U and Th varied with species, but not for the same species from different lakes. The levels of Cu, Co, Zn and Br varied little between species and lakes. Concn. of Cd, As, and Cr varied little between species and with species between lakes. AS

5 U 224
[Fruit wines.]
Poland. Polski Komitet Normalizacyjny
Polish Standard PN-71/A-79121 4pp. (1971) [Pl]

This standard replaces PN-63/A-79121 and covers beverages obtained by fermentation of fruit and berries, containing ≥9 and ≤18% alcohol, and belonging to still, sparkling, carbonated and flavoured red or white fruit wine categories. Standards on composition and organoleptic characteristics include the following, common to all categories: SO_2, total ≤200 mg l., free ≤40 mg/l.; As, ≤0.2 mg l.; Cu, ≤3.5 mg l.; Pb, ≤0.4 mg/l.; Zn, ≤5 mg l., Sn, ≤50 mg l.; Fe, ≤25 mg l.; storage life for wines packaged and stored according to regulations, 6 months. Regulations on packaging, storage, transport and examination are listed. SKK

5 U 251
[Frozen prepared dishes. Home-made pepper and garlic sauce.]
Bulgaria. Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard BDS 8277-70 4pp. (1970) [Bg]

This standard applies to a frozen home-made sauce made from red peppers, tomato puree, onion, carrots, potatoes, black peppers, sunflower seed oil, parsley, garlic and salt. The sauce should contain 20-21% DM; 10 ± 1% fat; 1.3-1.8% cooking salt; ≤10 mg Cu, ≤20 mg K, ≤15 mg Fe, ≤0.3 mg Pb, ≤5 mg Zn, ≤0.2 mg As (all as salts, kg product). The standard also covers packaging, labelling, sampling, testing, storage, transport and documentation. HBr

5 U 293
Specification for edible common salt.
India. Standards Institution
Indian Standard IS:253-1970 26pp. (1970) [En]
Price Rs 8.00 (Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard replaces IS:1845-1961 and IS:2035-1961. It prescribes the requirements and methods of sampling and test for edible common salt, free-flowing table salt and common salt for butter and cheese industry (dairy salt)

Requirements for common salt, table salt and dairy salt respectively (% by wt.) are: water insoluble matter (max.) 1.0, 2.2, 0.03; chloride content as NaCl (min.) 96.0, 97.0, 99.6; acid insoluble matter (max.) -, 1.5, -; matter soluble in water, other than NaCl (max.) 3.0, -, -; Ca, water soluble (max.) -, 0.10, 0.01; Mg, water soluble (max.) -, 0.10, 0.01; sulphates, as SO_4 (max.) -, 0.50, 0.3; alkalinity, as Na_2CO_3 (max.) -, 0.20, 0.1; Pb (ppm) max. -, 2.0, 2.0; Fe (ppm) max. -, 50.0, 10.0; As (ppm) max. -, 1.0, 1.0; Cu (ppm) max. -, -, 2.0. Methods for determining the above characteristics are included in an appendix. A second appendix considers methods of sampling edible common salt. Packaging and marking are also considered. VJG

5 U 298

Specification for gelatin, food grade.

India. Standards Institution

Indian Standard **IS:5719-1970** 17pp. (1971) [En] Price Rs 6.00. [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 1, India]

This standard, prescribes the requirements and methods of test for edible gelatin. Requirements include: moisture (% by wt., max.) 15; total ash (% by wt., max.) 3.0; SO_2 (mg/kg, max.) 1000; N (on dry basis, % by wt., min.) 15; Zn (mg/kg, max.) 100; As (mg/kg, max.) 2; Pb (mg/kg, max.) 5; Cu (mg/kg, max.) 30; total bacterial count (per g, max.) 10 000; Escherichia coli (in 10 mg) absent; and product must pass the gel strength test. Other aspects covered are packaging, storage, marking, sampling and tests. 6 appendices are included describing methods for determining moisture, gel strength, total ash, SO_2, N and Zn. VJG

5 U 308

[Canned fish: fish in special sauce.]

Bulgaria. Vurkhoven Suvet po Standartizatsiya

Bulgarian Standard **BDS 4157-70** 4pp. (1970) [Bg]

This standard replaces **BDS 4157-60** and covers canned carp, crucian carp, 'Besuga' (Cheilodactylis bergi), and cod in special (tomato) sauce. Standards on technological requirements, composition and organoleptic characteristics include: fish as % can contents, 75 ± 5; total fat, ≥6%; cooking salt, 1-2%; Sn, ≤200 mg/kg; Pb and As, no tolerance; foreign admixtures, no tolerance, pathogenic, facultatively pathogenic, non-sporulating and anaerobic microorganisms, no tolerance, aerobic sporeformers, ≤10 spores/g. Regulations on packaging, labelling, sampling, analysis, storage, transport and official documentation are listed. Storage life at ≤15°C is set at 24 months. SKK

5 U 309

[Grape concentrate for winemaking.]

Bulgaria. Vurkhoven Suvet po Standartizatsiya

Bulgarian Standard **BDS 7932-70** 3pp. (1970) [Bg]

This standard covers grape concentrate produced by vacuum concn. from fresh or sulphited must and intended for winemaking. Standards on technological requirements, composition and organoleptic characteristics include: total sugar as invert sugar, 60-65%; titratable acidity as tartaric acid, ≤20% [? 20°]; free SO_2, ≤20 mg/kg; Cu, ≤15 mg/kg; Pb, Zn and As, no tolerance; foreign admixture, no tolerance; signs or microbial decomposition, no tolerance; moulds, no tolerance. Regulations on packaging, labelling, sampling, analysis, storage, transport and official documentation are listed. SKK

5 U 310

[Canned fish: ocean fish in vegetable oil.]

Bulgaria. Vurkhoven Suvet po Standartizatsiya

Bulgarian Standard **BDS 7941-70** 5pp. (1970) [Bg]

This standard covers canned horse mackerel, mackerel, whiting, pilchard spp., sardinella spp. tuna spp., cod, hake and cape hake in vegetable oil alone or with condiments. Standards on technological requirements, composition and organoleptic characteristics include: proportion of fish to oil 80:20 (latitude ±5%); total fat, ≥18%; cooking salt, 1-2%; Sn ≤200 mg/kg; Pb and As, no tolerance; foreign admixtures, no tolerance; pathogenic, facultatively pathogenic, non-sporulating and anaerobic microorganisms, no tolerance; aerobic sporeformers, ≤10 spores/g. Regulations on packaging, labelling, sampling, analysis, storage, transport and official documentation are listed. Storage life at ≤15°C is set at 24 months. SKK

5 U 311

[Peach jam.]

Bulgaria. Vurkhoven Suvet po Standartizatsiya

Bulgarian Standard **BDS 8271-70** 3pp. (1970) [Bg]

This standard covers jam from white-fleshed peaches containing added organic acid and pectin of low esterification level or 'Zhelefiks', packaged in glass jars or cans and sterilized. Standards on technological requirements, composition and organoleptic characteristics include: DM (refractometer at 20°C), ≥50%; total sugar as invert sugar, 45 ± 1%; acidity as tartaric acid, ≤1%; Cu, ≤8 mg/kg; Sn, ≤100 mg/kg; Pb, ≤0.4 mg/kg; Zn, ≤5 mg/kg; As, ≤0.2 mg/kg; Fe, ≤10 mg/kg; pathogenic microorganisms and signs of microbial decomposition, no tolerance. Regulations on packaging, labelling, sampling, analysis, storage, transport and official documentation are listed. Storage life is set at 1 yr. SKK

5 U 312
[Frozen ready-to-eat dishes: 'veal with green beans'.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard **BDS 8275-70** 3pp. (1970) [Bg]

This standard covers frozen 'veal with green beans' packaged in waxed containers, Al foil (≤1 kg) or polyethylene (2.5 kg). Standards on technological requirements, composition and organoleptic characteristics include: meat, 25 ± 3%; green beans, 45 ± 3%; sauce, 30 ± 3%; fat, 4-8%, cooking salt, 1.5-2.0%; Cu, ≤10 mg/kg; Sn, ≤20 mg/kg; Pb, ≤0.3 mg/kg; Zn, ≤5 mg/kg; Fe, ≤15 mg/kg, As, ≤0.2 mg/kg; pathogenic and toxicogenic microorganisms and signs of microbial decomposition, no tolerance. Regulations on packaging, labelling, sampling, analysis, storage, transport and official decomposition are listed. Storage life at -18°C is set at 12 months. SKK

5 U 313
[Frozen ready-to-eat dishes: peppers stuffed with meat.]
Bulgaria, Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard **BDS 8276-70** 4pp. (1970) [Bg]

This standard covers frozen peppers stuffed with pig meat and beef or veal and packaged in waxed containers, Al foil (≤1 kg) or polyethylene (2.5 kg). Standards on technological requirements, composition and organoleptic characteristics include: peppers and stuffing, 48 ± 3%; sauce, 52 ± 3%; total fat, 4-8%; cooking salt, 1-1.5%; DM, ≥27%; Cu, ≤10 mg/kg; Sn, ≤20 mg/kg; Pb, ≤0.3 mg/kg; Zn, ≤5 mg/kg; Fe, ≤15 mg/kg; As, ≤0.2 mg/kg; pathogenic and toxicogenic microorganisms and signs of microbial decomposition, no tolerance. Regulations on packaging, labelling, sampling, analysis, storage, transport and official documentation are listed. SKK

6 H 921
[International enology codex.]
Office International de la Vigne & du Vin
Vinea et Vino Portugalie Documenta, Series II: Enologia 4 (5) 1-92 (1970) [Pt]

This international codex deals with the properties, identification characteristics, method of use, max. dosage, prohibited impurities and toxic compounds of additives used in winemaking. Materials included are: ammonium phosphate, bentonites, phytin, kaolin, bone charcoal, activated charcoal, citric acid, kieselguhr, gum arabic, metatartaric acid, potassium sorbate, potassium metabisulphite, sodium chloride, sodium sulphide, sorbic acid, tannin, tartaric acid. Analytical techniques are prescribed for determination of arsenic, total N, bromine index, sulphuric ash, chlorides, heavy metals and sulphates. ELC

6 J 871
Picking season changes in Valencia quality factors. Trends in total rag, rag toughness, juice, total soluble solids and acid.
Gilfillan, I. M.; Holtzhausen, L. C.; Koekemoer, W.; Plessis, J. A. du
Citrus and Sub-Tropical Fruit Journal **1971** (454) 11-15 (1971) [5 ref. En. af] [S. African Co-operative Citrus Exchange, Nelspruit]

Juice content, toughness of the rag, total soluble solids (TSS), acid content, and TSS acid ratio in Valencia oranges were studied with reference to size of the fruit, climatic conditions, harvesting time, and use of arsenical sprays. Juice concn. and TSS increased during the picking season, while acid concn. declined. Larger fruits had lower juice concn., TSS, and acid concn. than small fruit. Fruit grown in hot areas had higher juice concn., lower TSS and acid concn. than fruit grown in cold areas. The use of arsenical sprays was found to reduce both acid content and rag toughness during the early part of the season, which was related to the maturity and ripeness of the fruit. OA

6 U 366
[Sweet alcoholic beverages and liqueurs.]
Bulgaria, V'rkhoven S'vet po Standartizatsiya
Bulgarian Standard **BDS 398-70** 6pp. (1970) [Bg]

This standard replaces **BDS 398-57, BDS 910-52**, and **BDS 3843-59** and covers sweetened beverages and liqueurs of high alcoholic content obtained by mixing in various proportions alcohol, syrup, water, fruit juices, fresh-blossom infusions, essences, eggs and harmless dyes. Standards on technological requirements, composition and organoleptic characteristics are given for 33 kinds of beverages and liqueurs. Standards common to all include: Fe, ≤5 mg l.; Cu, ≤8 mg l.; Pb, As and Zn, no tolerance; preservatives, no tolerance. Regulations on packaging, labelling, storage, official documentation, sampling and analysis are listed. SKK

6 U 367
[Pelin' wine.]
Bulgaria, V'rkhoven S'vet po Standartizatsiya
Bulgarian Standard **BDS 2888-70** 3pp. (1970) [Bg]

This standard replaces **BDS 2888-57** and covers carbonated and ordinary 'Pelin' (wormwood) wine prepared from table wine, wormwood infusion, sugar, grape juice and concentrate and fruit concentrates. Standards on technological requirements, composition and organoleptic characteristics include: alcohol, 8.5-10.5 vol.%; sugar as invert sugar, 45-50 g l.; sugar-free extract, ≥15 g l.; titratable acidity as tartaric acid, >[?≤] 3 g l.; total SO_2, ≤300 mg l. (≤200 mg l. if preservatives are used); free SO_2, ≤40 (30) mg l.; Fe, ≤10 mg l.; Cu, ≤5 mg l.; As, Pb and Zn, no tolerance; artificial dyes, no tolerance; preservatives, sorbic acid ≤200 mg l., potassium sorbate ≤270 mg l. Regulations on sampling, analysis, packaging, labelling, storage, transport and official documentation are listed. SKK

6 U 400
[Fruit nectars.]
Bulgaria. Vurkhoven Suvet po Standartizatsiya
Bulgarian Standard **BDS 5162-70** 4pp. (1970) [Bg]

This standard replaces **BDS 5162-64** and covers single or mixed fruit nectars for direct consumption, produced by mixing fruit pulp with syrup in a 50:50 ratio preserved by physical means without use of ionizing radiations and packaged in glass bottles or lacquered cans. It contains regulations on quality requirements, packaging, labelling, storage, transport and official documentation. Standards include: extract (by refractometer at 20°C), 12-18% depending on type of fruit; total acidity as malic acid, 0.3-1.0%; ethyl alcohol, ≤0.3%; Cu, ≤5 mg/kg; Sn, ≤10 mg/kg (glass bottles) or ≤200 mg/kg (cans); Fe, ≤10 mg/kg; Zn, ≤5 mg/kg; Pb, ≤0.3 mg/kg; As, ≤0.2 mg/kg; artificial flavourings and dyes, no tolerance; non-sporeforming microorganisms and vegetative forms of sporeforming microorganisms, no tolerance. The following additions are permitted: citric acid ≤1%, ascorbic acid, juices of blackcurrant, bilberry, blackberry and other dark coloured fruit. SKK

7 N 358
Analysis of arsenic and bromine in marine and terrestrial oils.
Lunde, G.
Journal of the American Oil Chemists' Society **49** (1) 44-47 (1972) [9 ref. En] [Central Inst. for Ind. Res., Forskningsvn. 1, Oslo 3, Norway]

Samples of marine and terrestrial oils of both plant and animal origin have been analysed for As and Br content. 2 oil samples (cod liver oil and oil extracted from mackerel fillets) were fractionated on silica gel columns and Br was determined in the different fractions. The results obtained indicate that lipid soluble Br and As organic compounds are characteristic components of marine animal and marine plant oils (seaweed). The results also show that the Br is not localized in any particular compound or type of compound. The Br-containing compounds seem to be relatively stable, but the As-containing compounds are not. When oils containing As and Br were saponified, some of the As and Br compounds were found in the fatty acid fraction while others appeared in the water soluble fraction. AS

7 U 506
[Edible fungi products: sterilized fungi.]
Poland. Polski Komitet Normalizacyjny
Polish Standard **PN-71/A-78505** 5pp. (1971) [Pl]

This standard replaces **PN-65/A-78505** and covers whole or sliced fungi of single (unmixed) spp. intended for the home market and whole or sliced fungi of unmixed or mixed spp. intended for export, sterilized and packaged in jars or cans. Standards on classification, quality categories, description, permitted spp., and size, organoleptic and compositional requirements include the following common to all types and categories: presence of fungi of spp. other than declared, no tolerance; total acidity as lactic acid, ≤0.2%; coo salt, 0.5-1.0%; foreign organic matter of animal origin, no tolerance; foreign organic matter of vegetable origin, ≤0.03%; wt. of strained fungi as declared wt. of package contents, ≥55%; As, ≤0. mg/kg; Pb, ≤0.4 mg/kg; Cu, ≤10 mg/kg, Zn, ≤5 mg/kg; Sn, ≤50 mg/kg. Max. permitted mineral impurities range from 0.05% for chanterelles to 0 for Tricholoma. Regulations on packaging, storag sampling and examination are listed. The min. guaranteed shelf life is set at 12 months. SKK

7 U 507
[Edible fungi products: dried fungi.]
Poland, Polski Komitet Normalizacyjny
Polish Standard **PN-71/A-78510** 10pp. (1971) [

This standard replaces **PN-62/A-78500**, **PN-62/A-78501**, **PN-68/A-78506** and **PN-68/A-7850** and covers whole or sliced dried fungi of single (unmixed) spp. intended for the home market or for export. Standards on classification, quality categories, description and organoleptic and compositional requirements are listed for the following spp.: Boletus edulis, Gyroporus castaneus, Xerocomus subtomentosus, Leccinum scabrum, L. duriusculum, L. aurantiacum, Suillus luteus, S. bovinus, S. variegatus, Sarcodon (Hydnum) imbricatum, Marcoleplota procera, Tricholoma flavovireus, T. equestre, Cantharellus cibarius, Catathelasma (Clitocybe) imperiale, Armillariella mellea and (for export only) Gyromitra esculenta. The standards include the following common to all spp.: maggot reinfestation mites, moulds, no tolerance; presence of fungi of other spp., no tolerance; moisture, ≤12%; As, ≤1 mg/kg; Pb, ≤2 mg/kg; Cu, ≤30 mg/kg; Zn, ≤20 mg/kg; Sn ≤200 mg/kg. Regulations on packaging storage, transport, sampling and examination are listed. The min. guaranteed shelf life is set at 6 months. SKK

7 U 518
[Margarine.]
Poland. Polski Komitet Normalizacyjny
Polish Standard **PN-71/A-86907** 5pp. (1971) [Pl

This standard replaces **PN-65/A-86907** and covers the following types of margarine: ordinary margarine (emulsion of refined vegetable and animal fats (F) with water, an emulsifier, lecithin, dye, salt and sugar); pastry margarine (F with wate and, depending on pastry type, with normal or increased quantity of emulsifier and/or lecithin and with or without dye, sugar or salt); milk margarine (F with milk and water, an emulsifier, lecithin, 20 000 IU vitamin A and 2000 IU vitamin D/kg, dyes salt and sugar); and dessert margarine ('Palma', F

with milk and water, emulsifier, lecithin, dye and 30 000 IU vitamin A and 3000 IU vitamin D/kg; 'Maja', as for 'Palma' but with guaranteed content of essential fatty acids and C_{22} acids). Standards on technological requirements, composition and organoleptic characteristics include the following common to all types: peroxides in base, ≤2 (Lea number); Ni, ≤0.2 mg/kg; Pb, ≤2 mg/kg; As, ≤1 mg/kg; benzoic acid, ≤0.2%; sorbic acid, ≤0.1%; epihydrinic (glycidic) acid, no tolerance. Aroma substances may be added only if agreed by Ministry of Health. Regulations on packaging, storage, transport, sampling and analysis are listed. SKK

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7 U 525
[Stable confectionery products: biscuits, general requirements.]
Poland. Polski Komitet Normalizacyjny
***Polish Standard* PN-71/A-88051** 5pp. (1971) [Pl]

This standard covers hard-dough sweet, semi-sweet and non-sweet and soft-dough sweet biscuits without filling and biscuits with sugar + fat, chocolate, oilseed or other filling. Standards on technological requirements, composition and organoleptic characteristics include the following, common to all types of biscuit: ash, insoluble in 4 *N* HCl, ≤0.05%; As, ≤1 mg/kg; Pb, ≤2 mg/kg; Cu, ≤12 mg/kg; Zn, ≤ 20 mg/kg; Sn, ≤100 mg/kg. Regulations on packaging, storage, transport, sampling and analysis are listed. Min. guaranteed shelf life is set at: biscuits without filling with ≤10% fat, 4 months, with >10% fat, 3 months; biscuits with fatty fillings, 3 months, with butter filling, 1 month. SKK

7 U 544
[Ethyl alcohol and alcoholic beverages: determination of As.]
Roumania. Institutul Roman de Standardizare
***Roumanian Standard* STAS 184/23-70** 6pp. (1970) [Ro] [Bucharest, Roumania]

This standard covers both natural distilled and manufactured alcoholic beverages. Regulations on As determination by the Gutzeit test using mercuric chloride are listed. SKK

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8 A 370
[Method for wet-ashing biological materials.]
Verfahren zum Aufschluss und/oder zur Nassveraschung von organischem Material, insbesondere von biologischen Substanzen.
Sansoni, B.; Kracke, W. (Gesellschaft für Strahlenforschung mbH)
West German Patent Application 1 773 750 (1971) [De]

Prior to analysis for inorganic components, e.g. traces of Fe, Pb, Hg, Cd, As, Zn, or for radionuclides e.g. ^{137}Cs, ^{22}Na or ^{106}Ru, organic material, e.g. meat, fish, milk, flour, vegetables, bones or sugar, is ground and heated with H_2O_2 solution. A trace of ferrous salt is added, and after the spontaneous main reaction has taken place, the material is dried by evaporation. More H_2O_2 is added and evaporation repeated until a purely inorganic ash, contaminated only by the Fe added and ammonium salts, is left. For a more rapid method, H_2O_2 is added only once; in both cases unwanted fat is removed by extraction or separation with suitable organic solvents. W&Co

8 L 595
[Determination of SO_2 and trace elements in sugar.]
Diaconescu, L.; Costache, A.
Industria Alimentara **22** (5) 268-269 (1971) [9 ref. Ro, en, fr, de, ru] [Inst. de Cercetari si Proiectari Alimentare, Bucharest, Roumania]

8 samples of refined Roumanian sugar contained SO_2 and trace elements within the following ranges (mg/kg): SO_2, 0.46-0.95 (5 samples examined); Pb, 0.2-0.7; Cu, 0.1-0.2 (absent in 2 samples); Fe, 0.4-0.66 (absent in 4 of 7 samples examined); and As, 0.025 (in 2 samples, absent in other 6). It is pointed out that these values are much lower than the max. set by FAO at the 4th Session of the Codex Committee in April 1967. SKK

9 C 231
[Arsenic levels in foods.]
Westoo, G., Rydalv, M.
Var Föda **24** (3) 21-40 (1972) [13 ref. Sv, en] [St. Livsmedelsverk, 104 01, Stockholm 60, Sweden]

Arsenic concn. were determined in >800 food samples, ~180 of which were of vegetable origin. ~370 of the samples were fish flesh, ~250 were egg, meat, liver, kidney and sausage. With the exception of fish and shellfish, most of the samples contained <0.25 mg arsenic kg. 1 sample of French plums exceeded 1 mg/kg. Fish flesh, especially from marine fish, and fish liver often showed arsenic levels >1 mg kg. The highest level found (in plaice) was 25 mg/kg. Arsenic from fish flesh is rapidly excreted in the urine in man. AS

9 H 1318
[Methods of removing metals from must and wine.]
Methoden zur Entfernung der Metalle in Most und Wein. [A lecture]
Würdig, G.
Allgemeine Deutsche Weinfachzeitung **108** (11) 267-270 (1972) [De] [Weinforschungsinst., Landeslehr- & Versuchanstalt für Weinbau, Gartenbau und Landwirtschaft, Trier, German Federal Republic]

Max. permissible contents of trace elements in wine as established by the Office International du Vin and the latest W. German wine regulations are (mg/l.): Al 8, As 0.2, Pb 0.4, B (as basic acid) 80, Br (total) 1, F 5, Cd 0.1, Cu 5, Zn 6, Sn 1 and Ag 0.1. Tests have shown that even in areas of high contamination, these concn. are not reached. Methods of eliminating trace metals in the unlikely event of excess concn. in must and wine are described. TUB-IGB

9 P 1259
Abstracts of papers to be presented at the sixty-seventh annual meeting, Virginia Polytechnic Institute and State University, Blacksburg, July 26-29, 1972. Production division. [Milk and milk constituents.]
United States of America. Dairy Science Association
Journal of Dairy Science 55 (5) 689-690, 706 & 714-715 (1972) [En]

Abstracts in this section concerned with the effects of feeding on composition include the following: Relationship of milk fat and body fat concentrations of organochlorine compounds in cows, by G. F. Fries & G. S. Marrow, Jr. (P121); As in milk and blood of cows fed organic As compounds, by C. C. Calvert & L. W. Smith (P122); Metabolism of phenobarbital-2-^{14}C by the lactating dairy cow, by M. R. Bennink, R. A. Frobish, C. L. Davis, J. H. Clark & B. O. Brodie (P123); Effects of feeding a low Zn diet to dairy cows on performance and Zn content of milk, by M. W. Neathery, W. J. Miller, R. P. Gentry & D. M. Blackmon (P124); Relationship between the amounts of protected dietary and milk fat and milk fat polyunsaturated fatty acids, by L. P. Dryden, J. Bitman, H. K. Goering, T. R. Wrenn, C. H. Gordon & L. F. Edmondson (P158); Effects of feeding formaldehyde-treated soybean preparations on milk fat polyunsaturated fatty acids, by J. Bitman, H. K. Goering, L. P. Dryden, T. R. Wrenn, C. H. Gordon & R. A. Yoncoskie (P159); and Variations in milk fat triglyceride composition of cows in which nutritional changes increase or decrease the fat content of milk, by D. W. Kellogg, D. D. Miller, J. D. Tracy & E. C. Smith (P163). SAC

9 U 636
[Confectionery: arsenic determination.]
Roumania. Directia Generala pentru Metrologie, Standarde si Inventii
Roumanian Standard STAS 2213/15-70 4pp. (1970) [Ro] [Bucharest, Roumania]

This standard, which together with STAS 2213/15-69 replaces STAS 5836-58, covers determination of As by the Gutzeit test in sugar confectionery, chocolates and cocoa products and cakes. SKK

9 U 645
Gravy powder.
Central Africa. Standards Association
Central African Standard CAS No.S38: 1972 11pp. (1972) [En] [PO Box 2259, Salisbury, Rhodesia]

This standard covers gravy powder in 100-500-g packages or 3-kg catering cans and lists scope, definitions, requirements regarding factories and employees, ingredients, chemical and physical criteria, containers, packaging, storage, labelling, marking, use of the Certification Mark, sampling and pathogenic organisms. It includes appendices on methods of chemical analysis and physical test methods. Standards include: As, ≤1 mg/kg; Cu, ≤10 mg/kg; Pb, ≤2 mg/kg; moisture, ≤6% ≥72 h aft packaging; extraneous contamination, poisonous deleterious substances, no tolerance. SKK

10 S 1281
[Foreign substances and the health aspects of suspect residues in poultry meat.] Fremde Stoffe und gesundheitlich bedenkliche Rückstände in Geflügelfleisch.
Grossklaus, D.
Bundesgesundheitsblatt 15 (3/4) 42-50 (1972) [19 ref. De] [Bundesgesundheitsamt. Unter den Eichen 83-84, 1 Berlin 33, Germany]

Foreign H_2O content, aromatic substances, tenderizers, antibiotics, oestrogens, As residues, coccidiostats, pesticides, heavy metals and radioactive substances are reviewed and discusse with reference to German Federal Republic legislation. Their sources, and methods of detecti (agar diffusion test, spectrophotometry, TLC, GL animal testing) are described. OA

10 U 657
[Sterilized whole skinned tomatoes.]
Bulgaria, V"rkhoven S"vet po Standartizatsiya
Bulgarian Standard BDS 549-71 4pp. (1971) [B

This standard replaces BDS 549-60 and covers whole skinned tomatoes in tomato juice packaged in glass jars or cans, hermetically sealed and sterilized. Regulations on classification (extra and 1st quality), quality requirements, packaging and labelling, sampling, analysis, storage, transport an official documentation are listed. Standards common to both quality grades include: tomato content as % net wt. of product, ≥65; cooking salt≤1.5%; DM in immersion juice (excluding sal ≥5%; foreign admixtures, no tolerance; Cu, ≤10 product; Sn, ≤100 mg/kg for cans and ≤20 mg/kg for jars; Pb, ≤0.3 mg/kg; As, ≤0.2 mg/kg. Storage life is set at 1 yr. SKK

10 U 666
Specification for wool green BS, food grade.
India. Standards Institution
Indian Standard IS:6029-1971: 11pp. (1971) [[New Delhi 1, India]

Requirements and methods of test are prescribed. Min. dye content shall be 82% by wt. subsidiary dyes shall not exceed 2% by wt. Requirements are specified (as max. % by wt.) fo volatile matter at 135°C, chloride and sulphate, water-insoluble matter, combined ether extracts, 4,4'-DI (dimethylamino) benzhydrol (Michler's hydrol), 4,4'-DI (dimethylamino) benzophenone (Michler's ketone), and (as max. mg/kg) for As,

Cu and Cr. Detailed methods of analysis are given in appendices. Packaging and labelling requirements are also included. ELC

12 R 687
[Mercury content of fish.] Quecksilbergehalt von Fischen.
Anon.
Allgemeine Fischwirtschaftszeitung **24** (15) 28 (1972) [De]

The presence of Hg, Cd, Cu, As, Fe and DDT in different varieties of fish of wide geographical distribution are discussed, and their effects on human consumption and environment are summarized. OA

12 T 681
Measures trace metals in volatile flavourings.
Eiserle, R. J.
Food Engineering **44** (5) 86-87 (1972) [En]
[Fritzsche-D&O, New York City, USA]

A non-flame atomic absorption instrument for the determination of heavy metals (especially Pb, As, Fe, Cu and Cd) in volatile flavouring agents is briefly described. The apparatus employs a carbon rod work head, heated electrically to dry, ash and atomize samples syringed into an orifice in the rod. Exact determination in the parts/million range may be made. WHCA

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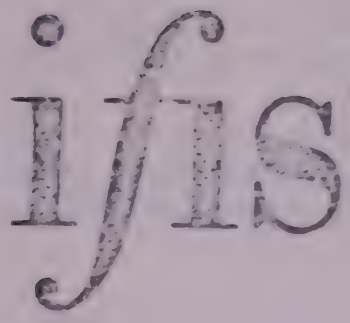

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INTRODUCTION

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Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would in any case encourage readers to write or telephone us with any comments or queries they may have.

J. NEWTON
ASSISTANT EDITOR

1 H 1
A rapid and highly sensitive single-sweep polarographic method of analysis for arsenic(III) in drinking water.
Whitnack, G. C.; Brophy, R. G.
Analytica Chimica Acta 48 (1) 123-127 (1969) [7 ref. En] [Michelson Lab., China Lake, California 93555, USA]

A simple, rapid, and extremely sensitive method of analysis for arsenic in drinking water is presented. The method is a single-sweep polarographic technique that will determine as little as 5 parts/billion arsenic with a relative error of 5-10% of the actual concentration. No special treatment of the sample is needed before the analysis. The method is useful in the examination of well water, spring water, and other drinking waters that contain arsenic in very low quantities (50 parts/billion or less). The method is shown to give more reliable results on drinking water than the Gutzeit method currently used by water chemists in the analysis of arsenic at low levels. AS

1 H 116
[Direct pulse-polarographic determination of As III and Pb in water and aqueous waste extracts.]
Direkte puls-polarographische Bestimmung von As III und Pb in Wasser und wässrigen Abraumauszügen.
Heckner, H. N.
Zeitschrift für Analytische Chemie 261 (1) 29-30 (1972) [3 ref. De] [Zentral Lab. für Chem. Analyse, Kernforschungsanlage, D-517 Julich, Postfach 365, Federal Republic of Germany]

Rapid and sensitive determination of As and Pb in drinking water by direct pulse-polarography is described. Sensitivity of method is 20 ppb (parts/billion) As in most cases (100 ppb in difficult samples) and 5-10 ppb Pb. Analysis takes 10-15 min. RM

1 S 61
[Studies on arsenic in livers of slaughtered cows.]
Battistis, P. de; Giordano, A.
Zooprofilassi 27 (1/2) 47-50 (1972) [It] [Cattedra d'Ispezione degli Alimenti, Fac. di Med. Vet., Naples, Italy]

In a study of the use of As compounds as growth promotors for animals being reared for food the first part deals generally with the types of compound used, methods of elimination in the animal, and the differences in the use of As in the USA and Italy. In the second part an experiment to determine the amounts of residual As in livers of slaughtered beef cattle is described. In this experiment, 202 cattle had their livers examined for As content and results showed that in all samples [illegible] the cattle seem able to eliminate the As from their systems quite quickly after [illegible] beef for human consumption does not constitute As [illegible] LA

1 U 20
[Quality standards for fruit juices in CMEA and some other countries.]
Samsonova, A. N.; Brumshtein, V. D.
Konservnaya i Ovoshchesushil'naya Promyshlennost' 27 (4) 32-35 (1972) [Ru]

Quality specifications for natural fruit juices (non-fermented), contents of DM, alcohol, ascorbic acid and/or preservatives and acidity (as malic acid), for various Communist states are covered. Lowest quality requirements were in Czechoslovakia, where in contrast to the Soviet Union, Bulgaria and others, the quality grades are not marked on the products. For example, for strawberry juice Soviet Standard GOST 656-70 stipulates a DM content of ≥7.0-8.5%, according to quality grades, 0.8-2.0% acid, ≤0.3-0.5% alcohol and ≤0.06% SO_2. The Czechoslovak Standard CSN 5632-10 stipulates ≥5.0% DM, ≤1.0% alcohol, but does not give the acid content. Bulgarian Standard BDS 2250-63 requires ≥6.0-7.0% DM, 0.4-1.0% acid, and ≤0.3-0.5% alcohol. Standards recommended by the CMEA (Council for Mutual Economic Aid) commission for max. contents of metals (mg/kg juice) are: Cu, 5; Sn 25; Pb, 0.3; As, 0.2; Zn, 5. These are compared with the international (Geneva commission) standard. STI

1 U 22
[Tomato juice.]
Romania. Institutul Roman de Standardizare
Romanian Standard STAS 4698-70 5pp. (1970) [Ro] [Bucharest, Roumania]

This standard covers juice obtained from tomatoes by crushing and straining and packaged in hermetically sealed containers without addition of colouring matter or preservatives. Technological requirements and organoleptic, physical, chemical and microbiological characteristics for (i) superior and (ii) ordinary quality juice include for (i) and (ii) respectively: soluble DM (excluding added acid and sugar), ≥5% for both; total acidity (as malic acid) related to soluble DM, ≤10 and ≤12 g/100 cm^3 [g/100 g?]; volatile acidity (as acetic acid) related to soluble DM, ≤0.6 and ≤0.8 g/100 cm^3 [g/100?]; NaCl, ≤1% for both; insoluble mineral impurities, related to soluble DM, ≤0.015 and 0.025%; ascorbic acid, ≥150 mg/kg and not stated; As, ≤2 mg/kg for both; Pb, ≤0.4 and ≤0.5 mg/kg; Cu, ≤2.5 and ≤5.0 mg/kg; Sn, ≤100 and ≤150 mg/kg; and pathogenic microorganisms, no tolerance. Regulations on methods of analysis, packaging, labelling, storage (at 4-12°C) and transport are listed. SKK

1 U 32
[Canned fish: mussels in sauce.]
Bulgaria. Komitet po Kachestvoto, Standartizatsiyata i Metrologiyata
Bulgarian Standard BDS [illegible]-71 4pp. (1971) [Bl]

The ratio of mussel to sauce must be 70:30, with a ±5% tolerance. The product must contain 1-2% [illegible] salt, [illegible] mg/kg Pb salts, ≤0.2 mg As [illegible] ≤10 mg/kg [illegible] ≤10 mg/kg ascorbic

sporeformers/g; there is no tolerance for pathogenic, non-sporeforming or aerobic organisms. This standard replaces BDS 5304-64. HBr

1 U 38
[Etur, a carbonated, non-alcoholic beverage.]
Bulgaria, Komitet po Kachestvoto, Standartizatsiyata i Metrologiyata
Bulgarian Standard BDS 9375-72 4pp. (1972) [Bl]

Etur, which contains essences of pear, rose, raspberry and strawberry, shall have 10 ± 0.3% sugar (as sucrose), an acid content (as tartaric acid) or 0.11-0.13%, ≥0.3% CO_2, ≤0.3 mgPb salts and ≤0.2 mg As salts (/1000 cm^3); there is no tolerance for mineral acids, pathogens, yeasts or moulds. HBr

1 U 40
Specification for calcium propionate, Food Grade.
India, Indian Standards Institution
Indian Standard IS: 6031-1971 9pp. (1971) [En] [New Delhi]

The specification includes requirements for purity as calcium propionate (% by wt.), max. % by wt. of moisture and water insoluble matter, and max. content (mg/kg) of As (3), Pb (10) and Fe (50). Methods of determination are prescribed for calcium propionate content (distillation with phosphoric acid and NaOH titration, or addition of NaOH and hydroxynaphthol blue and titration with disodium ethylenediaminetetraacetate); moisture (oven drying or preferably the Karl Fischer method); water-insoluble matter (filtration and drying); Fe (2,2-bipyridyl colour reagent). ELC

1 U 54
[Sweets. Quality requirements for attested product.]
USSR, Gosudarstvennyi Komitet Standartov
Soviet Standard GOST 5.120-71 11pp. (1971) [Ru] [Moscow, USSR]

This standard replaces GOST 5.120-69 and covers 31 named varieties of chocolate-coated sweets. Stipulated technological requirements, composition and organoleptic characteristics include the following common to all varieties: ash, insoluble in 10% HCl, ≤0.1%; Cu, ≤10 mg/kg; As, Pb and Zn, no tolerance. Regulations on methods of analysis, packaging, labelling, transport, storage and supplier's guarantee are listed. Guaranteed storage life is set at 15 days-4 months, depending on type. SKK

1 U 55
Specification for glucose syrup (liquid glucose).
Malaysia, Standards Institution of Malaysia
Malaysian Standard MS 3.7:1971 14pp. (1971) [En] [Kuala Lumpur]

Glucose syrup shall be clear, transparent, free from foreign odour, taste or matter and conform to the following requirements: TS, min. % 75; dextrose equivalent, min. % dry basis 25; sulphated ash, max % dry basis 0.5; SO_2, max. ppm 40, or for sugar confectionery manufacture only 450; As, max. ppm 1.0; Pb, max. ppm 2.0; Cu, max. ppm 2.0. Specifications are given for packaging and marking and selection and preparation of samples for analysis. Detailed techniques are prescribed in appendices for determination of TS (by vacuum oven drying) and dextrose equivalent (by Lane and Eyon cuprimetric procedure). ELC

1 U 121
[Confectionery products.]
Colombia, Instituto Colombiano de Normas Tecnicas
Colombian Standard ICONTEC 424 (1968) [Es] [Apartado Aereo 14237, Bogota 2, Colombia]

This standard covers general requirements of confectionery products, including classification (hard, soft, coated), general manufacturing conditions, bacteriological requirements, test methods, packaging and presentation. Products must contain ≤10 ppm Cu, ≤2 ppm Pb and ≤0.1 ppm As. HBr

2 A 127
Advanced analytical instrumentation.
Leslie, R. C.
Food Manufacture 47 (11) 41, 43, 46 (1972) [En] [Perkin-Elmer Ltd., Beaconsfield, Bucks, UK]

The various analytical instruments and techniques described are classified into 2 categories; (i) those which separate mixtures and (ii) those which identify single components or measure some physical property which can be related to chemical or physical structure. Included in (i) are: the use of gas-liquid and liquid-solid chromatography for the analysis of complex mixtures, e.g. essential oils and meat flavours; TLC for the separation and identification of pesticide residues in cereals, vegetables and fruit; analysis of halogen-containing residues using the electron capture detector; and liquid chromatography for the separation of lipids, antioxidants, oligosaccharides, food colours and for the resolution of aflatoxins B_1 and G_1. In (ii) details are given of: spectrophotometry, UV and visible absorption spectroscopy and their use for the quantitative determination of artificial colourings and assay of antioxidants, preservatives, additives, and pesticides present in foodstuffs; atomic absorption and its use in the determination of elements such as As, Pb, Cu, Co in foodstuffs; the application of IR absorption

identification of organic substances e.g. characterization of essential oils, determination of BHT in fats and the identification of preservatives extracted from meat; emission spectroscopy for quantitative analysis and simultaneous determination of several elements e.g. Na, K; fluorescence emission measurements for the determination of thiamine, riboflavine, other vitamins, lecithin, aromatic amines and carbohydrates; and elemental and thermal analysis. AA

2 S 263
[Use of dried yeast preparation in the production of canned meat for travellers.]
Zuchowicz, S.
Gospodarka Miesna 24 (9) 17-18 (1972) [Pl]

Dried molasses yeast for food purposes, supplied by a yeast factory in Poland and stated to contain ≥90% DM, ≤10% ash and ≥48% crude protein and to have a total bacterial count of ≤50 000/g, no coliforms in 0.1 ml, be free from anaerobic sporeformers and contain ≤5 mg Pb, As or Cu/kg and ≤10 mg Fe/kg, was tested in the preparation of canned meat for travellers (340 g or 395 g packs). The yeast was included at 2% and found to be fully suitable as substitute for sodium caseinate or soya protein, normally used in the recipe. It is pointed out that yeast costs 14.2 zlotys/kg vs. 60 zlotys/kg for sodium caseinate. SKK

2 U 139
[Vegetable products: dried vegetables.]
Polish Standard PN-72/A-77603 11pp. (1972) [Pl]

This standard replaces PN-63/A-77603 and covers dried red beet, onion, horseradish, garlic, green peas, cauliflower, white and red cabbage, savoy, dill leaves, parsley leaves, celery leaves, carrot, parsnip, parsley, leek and celery, whole, sliced, in granular or flour form, as well as mixtures of the named vegetables, intended for the home market. Definitions and stipulated organoleptic, physical and chemical requirements include, apart from those for individual vegetables, the following common to all: organic impurities of animal origin, [illegible]; As, Pb, Zn, Cu and Sn [illegible] ≤1, ≤2, ≤70, ≤20 and ≤200 mg/kg DM. [illegible] methods of analysis, [illegible] and methods of [illegible] SKK

3 H 409
A review of the arsenic cycle in natural waters. [Review]
Ferguson, J. F.; Gavis, J.
Water Research 6 (11) 1259-1274 (1972) [66 ref. En] [Dept. of Geography and Environmental Eng., Johns Hopkins Univ., Baltimore, Maryland 21218, USA]

A review of the occurrence and cycling of As in fresh waters is presented. The fate of As in natural waters has received little attention in past years, in spite of the fact that As is toxic and probably carcinogenic through exposure by drinking water. The chemistry of As in aqueous systems is reviewed. The potential pollutional hazard of As is from ingestion of drinking water with high concentrations of As, rather than consuming As-containing aquatic organisms. Although As is greatly concentrated in aquatic organisms, it is evidently not progressively concentrated along a food chain. In addition, As when consumed as an organically-bound species in flesh evidently has low toxicity. Careful surveillance and increased knowledge of the fate of As in the aquatic environment are needed to ensure that there will be no public health hazard. AS

3 J 329
Lead, arsenic, and copper content of crops grown on lead arsenate-treated and untreated soils.
Chisholm, D.
Canadian Journal of Plant Science 52 (4) 583-588 (1972) [12 ref. En, fr] [Res. Sta., Canada Agric., Kentville, Nova Scotia]

Increased lead and arsenic concentrations in the surface soil (0-15 cm), resulting from applications of lead arsenate ($PbHAsO_4$), increased both lead and arsenic levels in crops grown on treated plots. The lead levels in some crops approached or exceeded the Canadian residue tolerance of 2.0 ppm. Lead arsenate soil treatments did not affect copper absorption by crops. On areas such as old orchard land contaminated with lead arsenate residues it may be advisable to ascertain the soil lead status before planting certain crops, and also to determine the lead affinity and arsenic sensitivity of the plants to be grown. AS

4 M 343
Effects of fertiliser materials and combinations on the phytotoxicity, availability and content of arsenic in corn (maize).
Woolson, E. A.
Journal of the Science of Food and Agriculture 23 (12) 1477-1481 (1972) [24 ref. En] [Agric. Environmental Quality Inst., USDA, Beltsville, Maryland 20705, USA]

This study shows that some fertilizer materials significantly affected plant growth, available As, and As in the plant on corn (Zea mays, 'US 13') grown on Hagerstown silty clay loam treated with 0, 10, 100 and 500 ppm As. Phosphorus was shown

to be the most influential of the various fertiliser materials tested. It increased plant growth, available soil As and As residues in the corn tissue. The best fertilizer combination, based on plant growth, available As and As in the plant, was $NH_4NO_3 + Ca(H_2PO_4)_2 + K_2SO_4 + CaCO_3$. AS

4 U 251
Icing sugar.
Standards Association of Central Africa
Central African Standard **CAS No. S40:1972** 8pp. (1972) [En] Price $0.85 [Salisbury, Rhodesia]

This specification sets out the requirements for one grade of icing sugar. Icing sugar is defined as a finely-ground sugar, containing corn starch or tricalcium phosphate, which has been prepared from sucrose. Factory and employee, general and ingredient requirements are given. Physical requirements cover addition of colouring matter, freedom from foreign matter, grain size (not more than 2% shall remain on a 150 µm BS sieve and not less than 65% shall pass through a 75 µm BS sieve), and net mass. Chemical requirements are: sulphated ash, %, 1.25; moisture, %, max. 0.10; total reducing sugars, %, max. 0.030; corn starch, %, max. 3.0; tricalcium phosphate, %, max. 1.0; As, mg/kg, max. 1; Pb, mg/kg, max. 1. Microbiological requirements are: total colony count ≤100 colonies/g sugar; yeasts 0/g sugar; mould spores ≤10/g sugar. Requirements also cover packets, packing, storage, labelling, marking and sampling. Appendices list methods for physical, chemical and microbiological analysis. JA

4 U 255
[Wheat-gluten bread, 'Diabetic' type.]
Bulgaria, Komitet po Kachestvoto, Standartizatsiyata i Metrologiyata
Bulgarian Standard **BDS 9180-71**, 4pp. (1971) [Bg]

The bread shall meet the following requirements: wt. of loaf, 1000 g ± 3% or 500 g ± 4%; DM, ≥59%; moisture, ≤47.5%; porosity, ≥75%; acidity, ≤2° Neuman; salt (in terms of DM), ≤1%; Pb salts, ≤0.3 mg/kg; As salts, ≤0.2 mg/kg; pathogens and moulds, no tolerance. The standard also covers sampling, testing, packaging (unwrapped or in polyethylene film), storage and transport. The shelf life of the product is set at ≤72 h. HBr

4 U 261
[Roasted ground chick-pea.]
Bulgaria, Komitet po Kachestvoto, Standartizatsiyata i Metrologiyata
Bulgarian Standard **BDS 9206-71**, 3pp. (1971) [Bg]

This standard applies to roasted ground chick-pea intended for use as an additive to or [illegible] following requirements: moisture, ≤7%; acid-insoluble ash (in terms of DM), ≤3.5%; acid-insoluble ash, ≤0.5%; extractives, ≥22%; Cu, [illegible] mg/kg; Pb, ≤[illegible] mg/kg; As salts, ≤0.2%; pathogenic microorganisms, artificial colouring and foreign bodies, no tolerance. The product shall pass through a 0.8 mm sieve. The standard also covers sampling, testing, packaging (parchment, cellophane or polyethylene film in outer carton), storage (≤20°C, ≤75% RH) and transport. The shelf-life of the product is set at ≤9 months. HBr

5 A 245
[Analysis of biological materials with the aid of neutron activation.] Die Analyse biologischen Materials mit Hilfe der Neutronenaktivierung. [Review]
Tschirf, E.; Weiser, M.; Krocza, W. E.
Wiener Tierärztliche Monatsschrift 59 (11/12) 374-381 (1972) [30 ref. De, en] [Inst. für Med. Chem., Tierärztliche Hochschule, Vienna, Austria]

The following aspects are discussed: basic principles of neutron activation; problems in the practical application of activation analysis; studies of biological material by activation analysis (applications include determination of elements, especially toxic elements, in e.g. foods); and applications in veterinary medicine (e.g. determination of Hg in fish, and of As in slaughtered animals). JA

5 R 216
Persistent chemicals in marine mammals.
Koeman, J. H.; Peters, W. H. M.; Smit, C. J.; Tjioe, P. S.; Ceelj, J. J. Mede
TNO-Nieuws 27 (10) 570-573 (1972) [47 ref. En, nl] [Inst. of Vet. Pharmacology and Toxicology, Utrecht, The Netherlands]

Residue levels of various chlorinated hydrocarbons, including DDT, DDE, DDD, dieldrin, and polychlorinated biphenyls, and of metals such as Hg, Cd, As, Se, and Zn, in the tissues of whales, seals and other marine mammals are reported. AA

6 H 891
[Determination of minerals in [illegible] by a [illegible] (ultra high frequency) [illegible]]
[illegible]
Tetsuka, A.; Namba, Y.
Journal of the Society of Agricultural Chemistry, Japan [Nippon Jozo Kyokai Zasshi] 67 (4) 373-375 (1972) [5 ref. Ja] [Res. Inst. Brewing, Tokinogawa, Tokyo, Japan]

Al, As, B, Ca, Cd, Co, Cr, Cu, Fe, Ge, Hg, K, Mg, Mn, Na, Ni, Pb, Si, Sn, and Zn in sake, prepared with [illegible] determined by a UHF Plasma Spectrometer. All the above metal

6 J 841
Arsenic residues in soil and potatoes from Wisconsin potato fields - 1970.
Steevens, D. R.; Walsh, L. M.; Keeney, D. R.
Pesticides Monitoring Journal 6 (2) 89-90 (1972) [7 ref. En] [Dept. of Soil Sci., Univ. of Wisconsin, Madison, 53706, USA]

Potato fields in Wisconsin known to have been treated with sodium arsenite ($NaAsO_2$) were surveyed in 1970 to determine residue levels of As in potato tuber peelings and flesh and in the soil. Total soil As residues ranged from 2.2 to 25.7 ppm and were generally related to the amounts applied. Potato tuber peelings contained 0.2-2.6 ppm As, but regardless of the amount of $NaAsO_2$ applied, the tuber flesh did not exceed 0.6 ppm As. It was concluded that As had not accumulated in these Wisconsin potato fields to potentially harmful levels. AS

7 A 322
[Arsenic contents of commercial dried seaweeds.]
Shimokawa, K.; Horibe, N.; Teramachi, M.; Mori, H.
Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] 12 (4) 330-332 (1971) [9 ref. Ja] [Gifu Prefecture Inst. of Public Health, Nagamori, Gifu-shi, Japan]

Arsenic contents of 51 commercial dried seaweeds for Japanese food and a few spp. of red algae and commercial agars were analyzed by both of silver diethyldithiocarbamate method and Gutzeidt method. The contents of As of 22 samples of Kombu (Laminariaceae), 7 samples of Undaria sp., 8 samples of Nori (Porphyra sp.) and 3 samples of Aoaori (Nori-like products of uncertain sp.) were 29-91, 122-180, 29-72, 13-33 and 0.4-0.9 ppm, respectively. The As contents of the raw material red algae for agar manufacture were <1 ppm and those of commercial agars were <0.1 ppm. TM

7 H 986
Epidemiological study of arsenicism in the city of Antofagasta. (In "Trace substances in environmental health - V".)
Borgono, J. M.; Greiber, R.
pp. 13-24 (1972) [7 ref. En] Columbia, Missouri, USA, Univ. of Missouri [Servicio Nacional de Salud, Casilla 3979, Santiago, Chile]

This paper was presented at the University of Missouri's 5th Annual Conference on Environmental Health held on 29th June-1st July 1971. Epidemiological and clinical investigations of the As problem in Antofagasta are reported. Inhabitants of this city have been drinking water with a high content of As (0.8 ppm) for 12 yr (1959-1970). The study was carried out by clinical examination and As determination in hair and nails of the general population and hospital patients. The principal finding is the close relation between the prevalence of cutaneous lesions (>30% of the population) and the high As level in the drinking water. Clinical studies suggest that As could be one of the factors responsible for the high incidence of bronchial and pulmonary diseases. AS

7 H 1099
Adsorptive removal of arsenite and arsenate from natural waters.
Ferguson, J. F.; Anderson, M. A.
Abstracts of Papers, American Chemical Society 165, WATR 41 (1973) [En] [Johns Hopkins Univ., Baltimore, Maryland 21218, USA]

Arsenic has long been recognised as a poison in drinking water, however As toxicity is much greater for arsenite species than for arsenate; standards do not recognize this distinction and are always expressed for total As concn. The adsorption of As onto precipitate aluminium and iron hydroxides might be expected to occur in water treatment. An analytical technique capable of measuring 10^{-8} M arsenite or arsenate using single source p-cathode ray polarography has been developed. Oxidation and reduction of As in natural waters are discussed with special reference to the need to establish standards based on the oxidation state of As. AS

7 S 751
The effect of Carbarsone (33.6% w/v p-ureidobenzene arsonic acid) on bodyweight gain, food conversion and tissue arsenic levels of turkey poults.
Worden, A. N.; Wood, E. C.
Journal of the Science of Food and Agriculture 24 (1) 35-41 (1973) [14 ref. En] [Huntingdon Res. Centre, PE18 6ES, UK]

Carbarsone in the form of a proprietary formulation containing 33.6% w/v p-ureidobenzene arsonic acid was fed to turkey poults at dietary levels of ≤0.075%. There was a slightly increased mortality among the birds that had received the 0.075% level from the first day after hatching, but there was no evidence of any adverse effect upon food consumption or upon body weight gain among the survivors up to the time of killing at 24 wk, and no macroscopic evidence of any organ damage. Tissue arsenic residues at 24 wk were higher with a "zero withdrawal" period than when the Carbarsone was withdrawn 4 days before slaughter, but were still of a low order: the highest individual arsenic residue was 0.4 ppm in a sample of breast muscle from a poult that had received 0.075 ppm throughout, with a "zero withdrawal" period. AS

8 J 1083
[A study of toxic pesticide residues in foods. II.]
Ro, C. B.; Song, C.; Yun, K. D.; Kim, K. K.; Kwon, H. H.; Kim, Y. S.
Report of the National Institute of Health 6, 237-250 (1969) [12 ref. Ko, en] [Nat. Inst. of Health, Seoul, Korea]

Investigations of toxic pesticide residues in strawberries, melons, cucumbers, water melons, peaches respectively gave the following results (ppm); As, 0.1-0.8, 0.6-1.5, 0.5-1.3, 0.4-12, 0.6-1.2; Pb, 0.04-0.20, 0.2-0.9, 0.3-0.6, 0.1-0.26, 0.1-0.2; organic Hg, -, 0.01-0.03, -, 0.01-0.06, 0.01-0.03; DDT, -, 0.05-0.12, 0.05-0.14, 0.02-0.12, 0.07-0.13; parathion, -, trace-0.08, trace-0.07, trace-0.03, 0.03-0.21. KoSFoST

8 J 1084
[A study of toxic pesticide residues in food. III.]
Ro, C. B.; Song, C.; Kim, K. K.; Yun, K. D.; Kwon, H. H.
Report of the National Institute of Health **7**, 237-248 (1970) [14 ref. Ko, en]

Ranges of values for toxic contaminants found in food were (ppm): As, 0.050-0.6; Pb, 0.06-0.91; Cu, 0.11-1.7; organic mercury, 0.0-0.4; and γ-BHC, 0.009-0.04. [See also preceding abstr.] KoSFoST

8 R 354
Dry ashing technique for the determination of arsenic in marine fish.
Leblanc, P. J.; Jackson, A. L.
Journal of the Association of Official Analytical Chemists **56** (2) 383-386 (1973) [19 ref. En] [T. W. Beak Consultants Ltd., 306 Rexdale Blvd., Toronto 602, Ontario, Canada]

Dry ashing procedure, followed by silver diethyldithiocarbonate (AgDDC) colorimetric determination of As in marine fish, is presented. The sample is homogenized and a portion pre-ashed with $Mg(NO_3)_2$, using IR heat, followed by ashing in a 500°C muffle furnace. Residue is dissolved in HCl and As is reduced by means of Zn and HCl to arsine, which is complexed with AgDDC and determined colorimetrically at 535 nm. At temp. ≥460°C efficient ashing was obtained. Effect of various vol. of ashing aid (50% $Mg(NO_3)_2$) was also studied. Max. recovery and precision were obtained when a min. 8 ml 50% $Mg(NO_3)_2$ was used. Standard recoveries os inorganic As added to dry marine fish tissue gave values of 91-98%. Analyses of marine fish for As-1 and As-2 gave coeff. of variation of 6.0 and 8.1%, respectively. Results from dry ashing and wet digestion of a number of species of marine fish were not comparable. Levels of As found in different species of marine fish ranged from <0.4 to 27.0 μg As/g wet weight. Crabs were found to contain elevated amounts of As. AS

8 R 410
Arsenic, cadmium, copper, mercury and zinc in some species of North Atlantic finfish.
Windom, H.; Stickney, R.; Smith, R.; White, D.; Taylor, F.
Journal of the Fisheries Research Board of Canada **30** (2) 275-279 (1973) [6 ref. En, fr] [Skidaway Inst. of Oceanography, 55 West Bluff Road, Savannah, Georgia 31406, USA]

91 individuals representing 35 spp. of North Atlantic finfish were analysed for As, Cd, Cu, Hg and Zn. The samples included both offshore and inshore species of Osteichthys (including Anguilla rostrata, Conger sp., Mugil cephalus, Scomberomorus maculatus) and Chondrichthys. Concn. of metals in the Osteichthys vary widely. Most contained As concn. below the sensitivity of analysis, but some contained higher concn. ≤6.4 ppm. Hg was generally low but a few ppm were observed in some species. Cd, Cu and Zn concn. were similar in all fish except the smaller planktivorous fish such as anchovies. Similar and lower trophic level fish have a much higher concn. of Cd, Cu and Zn, suggesting a depletion in these metals up the food chain. Results indicate similar levels of metals in inshore and offshore species. Arsenic is higher in the Chondrichthys than the Osteichthys. Analyses of various tissues in Chondrichthys reveal higher metal concn. in the liver except for Hg which was higher in muscles. VJG

9 H 1397
Health hazards of persistent substances in water.
Hernberg, S.
WHO Chronicle **27** (5) 192-193 (1973) [1 ref. En] [Res. Office, Inst. of Occupational Health, Helsinki, Finland]

The recommendations of a working group convened by the WHO Regional Office for Europe and the Institute of Occupational Health, Helsinki, Finland, with reference to max. permissible levels of As, Cd, Pb, Mn and Hg in drinking water were as follows (mg/l.): As, 0.05; Cd, 0.005; Pb, 0.05; Mn, 0.5; and Hg, 0.001. The levels recommended for Cd and Pb are half those endorsed by WHO in 1971. AA

9 U 648
[Drinking water. Determination of arsenic content.]
USSR, Gosudarstvennyi Komitet Standartov
Soviet Standard **GOST 4152-72** 10pp. (1972) [Ru] [Moscow, USSR]

2 methods are laid down. In the 1st, the As compounds are reduced by H_2 (in presence of stannous chloride) to AsH_3, which is absorbed by paper impregnated with mercuric chloride. The yellow spots are treated with potassium iodide solution to form an I-Hg-As complex, from which the As content is determined by comparison with a standard reference. The sensitivity of the method is 2 μg/l. water. The 2nd method operates on the same principle as the 1st, but involves use of an alkaline plumbite solution to eliminate the effect of disruptive substances. The sensitivity of the 2nd method is 10 μg/l. The standard, which replaces **GOST 4152-48**, also stipulates preparation of sample, analytical procedure and interpretation of results. The standard is to be valid from 1.1.1974 to 1.1.1979. HBr

9 U 674
Tolerance for residues of new animal drugs in food. Arsenic.
USA, Food & Drug Administration
Federal Register **38** (124, June 28) 17000 (1973) [En] [Washington, DC]

The previous tolerance for total residue of combined As in uncooked edible by-products of chickens and turkeys of 1 ppm is increased to 2
CAS

11 G 546

[Shellac for foods and drugs.] Schellack für Lebens- und Genussmittel sowie Arzneimittel.
Marx, E. L.
Deutsche Lebensmittel-Rundschau **69** (7) 257-259 (1973) [6 ref. De] [6501 Budenheim, Postfach 14, Federal Republic of Germany]

As contents of from <0.03 to 0.08 ppm in 3 samples of branded commercial shellack are contrasted with contents of 1.6 and 1.8 ppm for 2 samples analysed in 1959. The difference is ascribed to improvement in bleaching methods. The max. official tolerance for As content of shellack is given as 3 ppm. SKK

11 H 1714

[Arsenic as trace element in water.] Arsen als Spurenelement in Wasser.
Senften, H.
Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene **64** (1) 152-170 (1973) [15 ref. De, fr] [Inst. für Lebensmittelchemie, Univ., Bern, Switzerland]

During an extensive survey of water supplies (ground, river and drinking) from various districts of Switzerland, the As content was determined. Results are tabulated as µg As/l. and as mg $HAsO_4^{2-}$/l. Methods of isolating trace amounts of As from large vol. of water were investigated and some detailed recommendations are given. Arsenic may be recovered from water by co-precipitation with alkaline iron hydroxide (method preferred) or evaporation to dryness with Na_2CO_3 and dissolving the residue in HCl. Final estimation is then made as AsH_3 using photometric measurement of the standard colour reaction with silver diethyldithiocarbamate. Comments are made on the influence of various mineral salts in water supplies and on the association of As with Fe and Na alkalinity. In general, water from rivers and lakes contained about 1.4 µg As/l. Treated drinking water was almost free from As, and in relation to the WHO standard of max. As content of 0.05 mg/l. drinking water, the daily intake from food is very small. ELC

11 S 1357

Dry ashing method for the determination of total arsenic in animal tissues: collaborative study.
George, G. M.; Frahm, L. J.; McDonnell, J. P.
Journal of the Association of Official Analytical Chemists **56** (4) 793-797 (1973) [7 ref. En] [Dept. of Pharmaceutical Development and Analysis, Salsbury Lab., Charles City, Iowa 50616, USA]

The method described for the determination of total As in animal tissue is sensitive to levels of 0.1 ppm. Tissue samples are dry-ashed in the presence of magnesium oxide and magnesium nitrate and the As is determined colorimetrically with silver diethyldithiocarbamate. The As content in the tissue is determined from standard curves prepared for each tissue, thereby correcting for losses during the ashing step. The average recovery for 8 collaborators was 98.8% for poultry tissue and 103.4% for swine tissue with an average overall coefficient of variation of 8.31% for the entire study. This method has been adopted as official first action. AS

12 R 597

Separation and analysis of organic-bound and inorganic arsenic in marine organisms.
Lunde, G.
Journal of the Science of Food and Agriculture **24** (9) 1021-1027 (1973) [12 ref. En] [Central Inst. for Ind. Res., Forskningsveien 1, Blindern, Oslo 3, Norway]

A method for the separation of stable arseno-organic compounds from inorganic As and the subsequent determination of both forms of As is described. The separation is based on volatilization of inorganic As as arsenic trichloride by addition of HCl to 6.6N and subsequent removal by distillation at 100°C. Remaining As in bound in arseno-organic compounds that are stable under these conditions. Total As in the samples analysed is reduced by 0.5-3 ppm by this treatment. Determination of As was performed by neutron activation and X-ray fluorescence. The method was applied to fresh fish, fish extracts, fish meal, seaweed, mussels and shrimps. AS

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Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would in any case encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES
ASSISTANT EDITOR

1

[Square-wave polarographic determination of arsenic and lead in rind of fruits.]
Hagiwara, K.
Japan Analyst [Bunseki Kagaku] **19** (4) 563-565 (1970) [5 ref. Ja, en] [Govt. Ind. Res. Inst., Osaka, Midorigaoka Ikeda-shi, Osaka-fu]

It has been found that As is extracted quantitatively into benzene from a comparatively high concn. of H_2SO_4 solution (9M) containing small amounts of chloride (0.5M) while Pb remains in the aqueous phase. As in the organic phase is back-extracted into water and determined by square-wave polarography using 2M HCl as a supporting electrolyte. Pb remaining in the aqueous phase is determined directly by square-wave polarography. The sample is decomposed with a mixture of 10 ml H_2SO_4 and 30–40 ml of HNO_3 in a Kjeldahl flask by heating. The solution after decomposition is transferred to a 100 ml beaker and 0.2 g hydrazine sulphate is added. It is heated again and the heating continued for about 10 min to reduce the As. The solution is transferred to a separating funnel and 10 ml of water containing about 0.5 g NH_4Cl is added. As is extracted twice into 10 ml and 5 ml of benzene and determined after back-extraction into water as described above. Pb in the aqueous phase is also determined directly after the solution is transferred to a 20 ml volumetric flask. As (0.3-7 ppm) and Pb (1-20 ppm) in rinds of apples were determined by the method. AS

2

[Copper, lead and tin in stored canned fish. II. Canned freshwater fish.]
Stanculescu, C.; Marin, E.; Sandulescu, C.; Ille, C.; Trica, A.; Iliescu, M.; Petrovici, C.; Popescu, P.
Lucrari de Cercetare **10**, 295-309 (1972) [8 ref. Ro, en, fr, de, ru]

The max., min., and mean values of Cu, Pb, Sn and As contents of various canned freshwater fish products were determined after storage for 1 yr. The initial As content was also determined. Metallic contamination was generally similar to levels found in marine fish except for rather lower levels of As. Cu ranged from 0 to 2.55 mg/kg. Pb ranged from 0 to 1.53 mg kg, but this included over 1/3 of batches almost free from Pb, 1/2 of batches containing only small amounts (<0.5 mg kg) and a few batches containing 0.5-1.0 mg kg. In lacquered cans the Sn content was <50 mg kg; in non-lacquered cans the amount increased to about 200 mg kg after 1 yr. As contents were low; max. levels reached were 1.0 mg kg in canned Danube herring and 0.5 mg kg in fish products in tomato sauce. [See preceding abstr. for part I.] [From En summ.]
ELC

3

Collaborative study of a colorimetric method for determining arsenic residues in red meat and poultry.
Buttrill, W. H.
Journal of the Association of Official Analytical Chemists **56** (5) 1144-1148 (1973) [4 ref. En] [Animal Plant Health Inspection Service, USDA, Beltsville, Maryland 20705, USA]

A colorimetric method is described for the determination of As residues, which uses the molybdenum blue complex for a spectrophotometric readout. The method was studied by 9 collaborators, each analysing 6 groups of 4 samples. Average recoveries for 0.28-2.41 ppm As were 87.6-109.3%; SD ranged from 0.037 to 0.225. The method has been adopted as official first action. AS

4

[Investigation of harmful trace elements in food.]
Ko, I. S.; Ro, C. B.; Song, C.; Kwon, H. H.; Kim, K. S.; Chung, K. H.; Joo, C. B.
Report of the National Institute of Health **9**, 389-406 (1972) [38 ref. Ko, en] [Dept. of Hygiene, Nat. Inst. of Health, Seoul, S. Korea]

Toxic trace elements were determined in foods commonly eaten in Korea; ranges of values determined were (ppm): Cu 0.01-7.60; Pb <0.01-0.83; Cd 0; Hg <0.01-0.09; As <0.01-0.13; Mn 0.01-11.5; and Zn <0.01-61.2. KoSFoST

5

[Studies on toxic pesticide residues in foods.]
Ro, C. B.; Song, C.; Kwon, H. H.; Kim, K. S.; Shin, S. W.; Lee, H. J.; Won, K. P.; Joo, C. B.
Report of the National Institute of Health **8**, 261-268 (1971) [9 ref. Ko, en] [Dept. of Hygiene, Nat. Inst. of Health, Seoul, S. Korea]

Toxic pesticide residues were determined in samples of agricultural produce obtained from markets in Seoul, Korea in 1968-1971. Pesticide residue concn. were within the permitted tolerances. As residues ranged from traces to 0.72 ppm, Cu concn. ranged from 0.24 to 6.73 ppm, organic Hg concn. ranged from traces to 0.08 ppm, and organochlorine residues (γ-BHC) ranged from 0.005 to 0.045 ppm. KoSFoST

6

[Content of arsenic in hens' eggs after administration of arsenical compounds.]
Battisti, P. de; Salzano, G.
Zooprofilassi **27** (9/10) 411-416 (1972) [2 ref. It] [Istituto di Ispezione degli Alimenti di Origine Animale, Univ. di Napoli, Italy]

Groups of 10 hens received in the drinking water

(i) sodium arsenilate at 1.4 g (0.44 g As)/30 l. for 9 consecutive days, (ii) sodium arsenilate at 5.25 g (1.64 g As)/30 l. for 7 days; (iii) 4-hydroxy-3-nitrobenzenearsonic acid at 0.4 g (0.12 g As)/25 l. for 9 days; (iv) 4-hydroxy-3-nitrobenzenearsonic acid at 1.6 g (0.48 g As) for 7 days; or (v) no supplement (controls). Daily values are tabulated for As contents of fresh yolk of eggs laid during the 1st 15 days after beginning of (i), (ii) and (iv) treatments. Max. values and values on 15th day were respectively (ppm): (i), 0.58 (7th day) and 0.19; (ii), 0.49 (6th and 9th days) and 0.04; and (iv), 0.42 (7th day) and 0.02. Values for (iii) and controls ranged from 0 to 0.14 ppm. SKK

7

[Studies on the contents of mercury, cadmium, lead, and copper in edible seaweeds in Korea.]
Kim, C. Y.
Bulletin of the Korean Fisheries Society **5** (3) 88-96 (1972) [9 ref. Ko, en] [Pusan Fisheries Coll., S. Korea]

17 species of edible seaweeds were examined for their heavy meatl content. Concn. in air-dried seaweeds were as follows: Hg 0.02-0.52 ppm, Cd 0.02-1.48 ppm, Pb 0.20-1.31 ppm, and Cu 0.90-17.0 ppm. KoSFoST

8

[Content of arsenic in commercial molluscs and crustaceans.]
Battistis, P. de; Cicala, G.; Salzano, G.
Zooprofilassi **27** (9/10) 405-409 (1972) [14 ref. It] [Istituto di Ispezione degli Alimenti di Origine Animale, Univ. di Napoli, Italy]

The following mean values with SEM (numbers of samples in parentheses) are quoted for As content of molluscs and crustacea from different parts of Italy (ppm): shrimps (9), 2.46 ± 0.586; prawns (8), 5.72 ± 0.687; mantis shrimps (7), 6.18 ± 0.998; octopus (7), 1.17 ± 0.279; squids (9), 0.85 ± 0.105; cuttlefishes (10), 0.31 ± 0.169; date shells (8), 5.12 ± 0.398; knotted cockles (7), 3.56 ± 0.629; mussels (18), 2.31 ± 0.319; clams (8), 4.35 ± 0.813; coquina clams (12), 4.95 ± 0.489; lobsters (10), 3.12 ± 0.464; Venus verrucosa (7), 10.76 ± 0.995; oysters (9), 2.44 ± 0.312; razor shells (10), 2.89 ± 0.279; and Murex spp. (3), 9.80 ± 4.28. SKK

9

[Determination of some biocides in veal.] Die Bestimmung einiger Biozide in Kalbfleisch.
Attig, D.; Eichner, K.; Heffter, A.; Oberdieck, R.; Vöcks, R.; Walther, G.
Schlacht- und Viehhof-Zeitung **73** (7) 253-256, 263-265 (1973) [17 ref. De, fr] [Chem. Landesuntersuchungsanstalt, Karlsruhe, Federal Republic of Germany]

Samples of muscle, liver and kidney tissue from 18 calves were analysed for Hg, Pb and Cu (by atomic absorption spectrophotometry), As (by spectrophotometry), chlorinated hydrocarbons and polychlorinated biphenyls (by GLC) and diethylstilboestrol. The analytical procedures used are discussed in detail, and results are discussed in relation to tolerances. AJDW

10

Separation, identification and quantitative estimation of non-nutritive toxic elements, lead, copper and arsenic in food by thin layer chromatography.
Mukherjee, D.; Saha, A.; Mathew, T. V.
Research and Industry, India **17** (4) 150-151 (1972) [10 ref. En] [Central Food Lab., Calcutta 16, India]

A method for the separation and quantitative estimation of 3 trace metals, Pb, Cu and As, in foods, by TLC using cellulose as absorbent is described. Solvents found to give the best separation were: ethanol:5N HCl (9:1) and chloroform:isoamyl alcohol:conc. HCl (10:10:1). The developing time for each solvent was 1 h. After drying, the plates were sprayed with 0.05% solution of dithizone in carbon tetrachloride, a black spot denoted Cu and a yellow spot As. The plates were then sprayed with 25% ammonia solution and a red spot indicated Pb. The limit of detection of the method is 2 μg. AA

11

[Health risks resulting from the persistence of certain substances in water.]
Hernberg, S.
Brasserie Malterie Europe **23** (12) 285-286 (1973) [Fr] [Inst. de la Med. du Travail, Helsinki, Finland]

A study group, meeting in Helsinki in April 1972, recommended that the max. permitted levels of metals in drinking water should be (as mg/l.): As, 0.05; Cd, 0.005; Pb, 0.05; Mn, 0.5; and Hg, 0.001. Further studies on the ditribution, metabolism and toxicity of metals, and on the standardization of analytical methods were recommended. MEG

12

Recovery of arsenic by dry ashing from animal tissue fortified with organoarsenicals or arsenic trioxide.
George, G. M.; Frahm, L. J.; McDonnell, J. P.
Journal of the Association of Official Analytical Chemists **56** (6) 1304-1305 (1973) [8 ref. En] [Pharmaceutical Development and Analysis Dept., Salsbury Lab., Charles City, Iowa 50616, USA]

A study was conducted to establish whether or not As recovery from animal tissue is independent of As source. Control chicken liver and kidney tissues were fortified with 1.0 or 2.0 ppm As from As_2O_3, roxarsone, arsanilic acid, nitarsone, or carbarsone. The tissue samples were dry ashed and total As was determined colorimetrically. Arsenic

recovery from the organoarsenical-fortified tissue samples is essentially complete for all drugs tested. Mean recoveries ranged from 98 to 100% of the theoretical amount expected. AS

13

[Removal of residual pesticides from vegetables. I. Removal of residual pesticides from komatsuna (Brassica chinensis L.) by washing.]
Deura, H.
Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] **13** (1) 63-67 (1972) [10 ref. Ja, en] [Environmental Hygiene Lab., Lion Fat & Oil Co., Ltd., Hirai 3-chome, Edogawa-ku, Tokyo]

Removal of pesticide residues by washing with a detergent was studied using komatsuna (Chinese cabbage, Brassica chinensis L.) which had been sprayed with arsenate or BHC. Removal efficiency was calculated from the ratio of the sum of the pesticide residues found in the washing solution and in the rinsing water to the residues found in the unwashed vegetables. Almost a complete removal of As and Pb was achieved through detergent washing. Removal efficiency for BHC by detergent washing was about 2.5 × higher than that of water washing. Effect of rinsing following detergent washing was found to be significant. TM

14

[Removal of residual pesticides from vegetables. II. Removal of residual pesticides from Shantung greens and other vegetables by washing.]
Deura, H.
Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] **13** (1) 68-73 (1972) [5 ref. Ja, en]

Shantung greens sprayed with lead arsenate, sumithion and elsan, cucumber sprayed with sumithion, tomato sprayed with malathion, cabbage sprayed with dichlorvos were washed by dipping, shaking, brushing or rubbing with or without detergent. Pb and As were removed more efficiently and more completely by detergent washing. As for the organic pesticides, the detergent washing was found to be effective and further improved by washing with a vigorous mechanical process such as brushing or rubbing. TM

15

[Arsenic residues in carcasses of edible animals.]
Arsenrückstände im Fleisch von Schlachttieren.
Krocza, W.; Schuh, M.
Wiener Tierärztliche Monatsschrift **60** (12) 366-371 (1973) [19 ref. De, en] [Radioisotopenmessstelle, Bundesanstalt für Virusseuchenbekämpfung bei Haustieren, Vienna, Austria]

The As concn. in tissues of (i) 12 roe deer, (ii) 15 cattle, (iii) 10 swine, (iv) 6 Austrian-produced chickens, (v) 7 imported chickens and (vi) an unspecified number of control chickens (fed a synthetic diet) were determined by neutron activation analysis. Tables and graphs of results are given. Mean values were (ppm): (i) muscle 0.008; (ii) muscle 0.011; (iii) muscle 0.102; (iii) kidneys 0.087; (iii) liver 0.49; (iv) muscle 0.076; (iv) gizzard 0.131; (iv) liver 0.091; (v) muscle 0.068; (v) gizzard 0.052; (v) liver 0.040; (vi) muscle 0.0076; (vi) gizzard 0.034; and (vi) liver 0.035. The relatively high values for (iii), (iv) and (v) are discussed, with reference to use of As-containing feed additives in intensive rearing systems. Adoption of a random sampling procedure for testing for excessive As level is suggested. AJDW

16

Atomic absorption spectrometric determination of arsenic.
Hoover, W. L.; Melton, J. R.; Howard, P. A.; Bassett, J. W., Jr.
Journal of the Association of Official Analytical Chemists **57** (1) 18-21 (1974) [11 ref. En] [Dept. of Agric. Analytical Services, Texas A&M Univ., College Station, 77843, USA]

The official AOAC method for As in feeds has been adapted to an atomic absorption spectrophotometric technique in which As trapped in the absorbing solution is aspirated into the flame. Values as low as 0.5 μg As/g can be measured in a 10 g sample. A modified digestion procedure is described. A second method is described for determination of submicrogram quantities of As whereby arsine gas is generated into a plastics bag and introduced directly into the flame. Air-acetylene fuels are utilized, requiring no alterations in the nebulizer and mixing chamber. Sensitivity attained from a 10 g sample is 0.1 μg As/g. Results of various biological matrices [including fish and crab muscle], which were determined by the AOAC method and the 2 described methods, compare favourably. AS

17

[Hygienic and chemical aspects of ion exchange membranes.]
Ishiwata, H.
Bulletin of the National Institute of Hygienic Sciences [Eisei Shikenjo Hokoku] **91**, 79-81 (1973) [6 ref. Ja, en]

A study was made of ion-exchange membranes which are used for concentration of sea water and for desalting some foods. Results for solids, water-soluble substances, arsenic, heavy metals, residue on ignition and total ion-exchange capacity are tabulated. AS

18

The carbon rod atomic absorption analysis of arsenic in plant and animal tissues.
Baird, R.; Gabrielian, S.
Abstracts of Papers, American Chemical Society 167, ENVT 46 (1974) [En] [San Jose Creek Water Quality Lab., 1965 South Workman Mill Road, Whittier, California 90601, USA]

The distribution and fate of As discharges into the aqueous environment have become a great concern, especially with regards to the marine biota. This paper describes a wet acid digestion and an acid bomb digestion of plant and animal tissues, followed by flameless carbon rod analysis for As. A comparison of the 2 digestion techniques is given, as are some typical data obtained from kelp and fish samples. The technique is applicable to the μg/kg-mg/kg (dry wt.) range. The distribution gradient of As in certain species around a sewage outfall is also discussed. AS

19

[Study of trace elements in meat.] Untersuchungen über Spurenelemente im Fleisch.
Hecht, H.
Archiv für Lebensmittelhygiene **24** (11) 255-258 (1973) [18 ref. De, en] [Bundesanstalt für Fleischforschung, Kulmbach, Federal Republic of Germany]

Mean values with SD are tabulated for contents of As, Br, Cd, Cr, Hg, Sb, Se, Sn, Pb, Fe, Zn, Cu, Co, Mo, Ca, Na, Rb, Au, Ag, Ba and La in muscle tissues (mainly longissimus dorsi) of 80 pigs, 30 adult cattle, 30 young cattle and 30 calves. Mean contents of Hg and As (ppm) were respectively 0.043 and 0.03 for pork, 0.004 and 0.002 for beef and 0.002 and 0.001 for veal. SKK

20

[Determination of arsenic in apples.]
Arsenbestimmung in Äpfeln.
Nagy, M.
Deutsche Lebensmittel-Rundschau **70** (5) 173-175 (1974) [14 ref. De, en, fr]

A method for determination of As residues in apples is described. Apple samples are comminuted, and ashed at 550°C with MgO + $Mg(NO_3)_2$ + cellulose powder; the As in the ash is then converted to AsH_3, which is then reacted with silver diethyldithiocarbamate, and the absorbance of the resulting solution is determined at 545 nm. As concn. is calculated from reference curves. The determination limit of the method is 0.5 μg As; recovery is 90-100%. Tables of values are given for the As concn. in 134 samples of apples from various countries; As concn. ranged from 0 to 0.34 ppm. Tables of values are also given for the concn. of As in the peel and pulp of apples; the peel from 1 kg apples contained 0.025 mg As and the pulp from 1 kg apples contained 0.048 mg As. AJDW

21

[Natural occurrence of arsenic in foods of vegetable origin.] Über das natürliche Vorkommen von Arsen in Lebensmitteln pflanzlicher Herkunft.
Reinhard, C.
Mitteilungsblatt der GDCh-Fachgruppe Lebensmittelchemie und Gerichtliche Chemie **28** (7) 215-218 (1974) [9 ref. De] [Landesuntersuchungsamt für das Gesundheitswesen Nordbayern, Chemische Untersuchungsanstalt Würzburg, Federal Republic of Germany]

In view of a statement by the German Health Authorities to the effect that a concn. of ≤0.1 ppm As in foods of vegetable origin can be regarded as of natural occurrence (except where there is cause to suspect otherwise), a total of 68 apples of 14 different varieties from 5 different countries were analysed. 41 (60.3%) had ≤0.01 ppm AS, 26 (38.3%) had 0.02-0.19 ppm, and the remaining 1 had 0.3 ppm. Further tests on 50 different fruit and vegetables revealed As contents of 0.01-0.05 ppm, and tests on 49 samples of wine showed As contents of 0.01-0.04 ppm. It is concluded that 0.02-0.03 ppm may be regarded as the 'natural' As content of the products concerned. HBr

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H. BROOKES
ASSISTANT EDITOR

1

[Determination of arsenic in tea plant by neutron activation analysis.]
Takeo, T.; Shibuya, M.
Journal of Food Science and Technology [Nihon Shokuhin Kogyo Gakkai-shi] 19 (2) 91-95 (1972) [8 ref. Ja, en] [Nat. Res. Inst. of Tea, Kanaya-cho, Shizuoka, Japan]

Detn. of As in raw samples of tea by Ge (i) γ-ray spectrometry was not possible because the ^{76}As peak was masked by the ^{82}Br peak. A method for removal of Br before As detn. is described. Decomposition of tea powder with conc. HNO_3-$HClO_4$-conc. H_2SO_4 mixture remove Br, and the γ-ray peak of ^{76}As became evident. The detection limit for As was 0.2 μg. When As was separated from other elements by the Gutzeit method, 2 characteristic γ-ray peaks were shown on the spectrogram, and >0.05 μg As could be determined. Residues of $PbHAsO_4$ spray on tea leaves were determined; As content immediately after spraying was 285 ppm; after 4 and 6 months' further growth, residues were 53 and 29 ppm, respectively. Almost all samples (13 analysed) of commercial green tea product contained no As, but 2 samples contained 0.9 and 1.5 ppm. SKa

2

Bound arsenic fractions in a crustacean.
Woolson, E. A.; Kearney, P. C.; Isensee, A. R.; McShane, W. G.; Irgolic, K. J.; Zingaro, R. A.
Abstracts of Papers, American Chemical Society 168, PEST 8 (1974) [En] [USDA, Beltsville, Maryland 20705, USA]

To isolate and identify the various forms of As bioaccumulated in aquatic organisms, ^{74}As-sodium arsenate and ^{14}C-monosodium methanearsonic acid (MSMA) were added to a model microecosystem containing daphnids (Daphnia magna), crayfish (Procambarus sp.), algae (Oedogonium cardiacum), catfish (Ictalurus punctatus), 10 kg of soil (Willacy fine sandy loam), and 80 l. of water. The catfish served as a food for the crayfish. Crayfish bioconcentrated arsenate and MSMA up to 10-fold from water containing 1 ppm of either arsenical. Homogenized crayfish were fractioned using cold 5% trichloroacetic acid (TCA), warm 75% ethanol, hot 5% TCA, and residual materials. The amount of radioactivity appearing in these fractions was variable but a typical distribution for ^{74}As in crayfish was 34%, 44%, 19%, and 4%, respectively; for MSMA, 51%, 35%, 4%, and 10%, respectively. A major compound from ^{74}As treated crayfish was shown to be neither MSMA nor cacodylic acid. A single compound was observed in MSMA-treated crayfish. Further work is in progress to identify these major As-containing compounds. AS

1

3

[Detection and determination of organic arsenic compounds in fruit.] Nachweis und Bestimmung organischer Arsenverbindungen auf Obst.
Berg, H.; Sperlich, H.
Mitteilungsblatt der GDCh-Fachgruppe Lebensmittelchemie und Gerichtliche Chemie 28 (10/11) 298-304 (1974) [11 ref. De] [Chem. Landesuntersuchungsanstalt, Stuttgart, Federal Republic of Germany]

Details are given of studies on determination of residues of As-containing pesticides (especially 'Tuzet', a mixture of Ziram, Thiram and the As-containing fungicide Urbacid) on apples. Pesticides are washed off the surface of the apple with ethyl acetate/acetone (2:1); half the resulting solution is purified by column chromatography, then used for isolation of dithiocarbamates by TLC on Kieselgel using a benzene/ethyl acetate (9:1) solvent system. Dithiocarbamate spots are detected by spraying the chromatogram with a mixture of palladium chloride in 0.1N HCl and p-nitrosoaniline in methanol. The other half of the pesticide extract is used for detn. of As by a modified Gutziet method [AOAC methods of analysis (1970) Ed. 11, p. 399] or by a silver diethyl dithiocarbaminate method. The detection limit for TLC detn. of dithiocarbamates was approx. 1 μg; detection limits for As were 1 μg by the modified Gutziet method and 0.5 μg by the silver diethyldithiocarbaminate method. As residues were detected in 38 of 61 samples of apples examined; 4 samples contained ≥0.1 mg As/kg. AJDW

4

Comparison of wet ashing and dry ashing for the determination of arsenic in marine organisms, using methylated arsenicals for standards.
Uthe, J. F.; Freeman, H. C.; Johnston, J. R.; Michalik, P.
Journal of the Association of Official Analytical Chemists 57 (6) 1363-1365 (1974) [10 ref. En] [Halifax Lab., Fisheries & Marine Service, Environment Canada, 1707 Lower Water St., Halifax, Nova Scotia B3J 2R3, Canada]

A vanadium catalyzed pentoxide-sulphuric acid-nitric acid digestion procedure is described which gave higher values for total As than the AOAC dry ash procedure with fish and shellfish tissue. Recoveries of added methylarsenic compounds were also lower by dry ashing procedures but essentially complete by the new ashing procedure. As levels in a variety of shellfish and fish tissues as determined by wet ashing averaged 6.3% higher than dry ash values. In lobster hepatopancreas the difference was 13.1% for a large number of samples from a number of sampling areas. AS

5

The determination of small amounts of arsenic in organic matter.
United Kingdom. Analytical Methods Committee.

Metallic Impurities in Organic Matter Sub-Committee
Analyst 100 (1186) 54-62 (1975) [11 ref. En]

The molybdenum blue (MB) method for accurate detn. of As, recommended in 1960, was compared with the more recent silver diethyldithiocarbamate (SDC) method [British Standards Institution (1968) BS 4404: 1968]. It was first established that As is not lost by volatilization during wet oxidation of organic matter by H_2SO_4 and HNO_3 (using ^{74}As tracer). Recovery of As from pure solutions was satisfactory by both methods, but rather higher for SDC (99.3%) than MB (94.0%). Further trials with addition of 15 μg inorganic As to 5 g quantities of sucrose, feeding stuff or dried liver gave satisfactory recoveries by MB in all cases but rather low recoveries by SDC for dried liver (SDC 64.2%, MB 83.7%). Similar results were obtained with additions of organic As (carbarsone). The SDC method is quicker, requires less skill, and is unaffected by trace metals, but may be unsatisfactory in particular cases of materials difficult to oxidize and requiring severe acid treatment (e.g. liver). The SDC reagent is also subject to variations between batches, which affect results. The MB method was improved considerably by a newly-developed procedure in which the digest is distilled with KBr in special apparatus; As is recovered as the bromide and measured as the MB complex. The new MB method is quicker and simpler than the original, the colour is stable and recoveries are much improved (e.g. 92% for liver). The SDC method is useful in many cases, but the new MB method is now recommended for general use; detailed procedure is given in an Appendix. ELC

6

Public health hazards associated with arsenic poisoning in cattle.
Selby, L. A.; Case, A. A.; Dorn, C. R.; Wagstaff, D. J.
Journal of the American Veterinary Medical Association 165 (11) 1010-1014 (1974) [40 ref. En] [Coll. of Vet. Med., Univ. of Missouri-Columbia, Columbia, Missouri 65201, USA]

The public health hazard of residues of As in tissues of cattle is discussed, with reference to: 2 typical case histories of As poisoning of cattle in Missouri, USA; methods of analysis and their relative accuracies; As uptake, metabolism and elimination by ruminants; and the danger of carcasses of acutely or chronically As-poisoned animals being used as food. It is considered that most As-poisoned cattle would not pass ante- or post-mortem inspection. AJDW

7

Study on the carcinogenicity of lead arsenate and sodium arsenate and on the possible synergistic effect of diethylnitrosamine.
Kroes, R.; Logten, M. J. van; Berkvens, J. M.; Vries, T. de; Esch, G. J. van
Food and Cosmetics Toxicology 12 (5/6) 671-679 (1974) [13 ref. En] [Lab. of Toxicol., Nat. Inst. of Public Health, PO Box 1, Bilthoven, Netherlands]

A lifetime study (29 months) was carried out on the combined effects of As and the lung carcinogen diethylnitrosamine (DENA) in rats. In order to investigate whether sodium arsenate or lead arsenate is a carcinogen and whether any synergistic or additive action exists between DENA and Pb and/or As, rats were fed lead arsenate in the diet at 1850 or 463 ppm, sodium arsenate at 416 ppm, and 463 ppm lead arsenate or 416 ppm sodium arsenate in combination with DENA given in an intubated dose of 5 μg/day on 5 days/wk. At a level of 1850 ppm, lead arsenate was toxic and caused intra- and extrahepatic bile-duct lesions. Sodium arsenate showed no carcinogenic action at the dose level used. No additive or synergistic effect could be attributed to DENA, which also failed to induce tumours at the low dose level used, suggesting the possible existence of a no-effect level for this carcinogen. VJG

8

Effect of boron and arsenic on juice acidity of grapefruit.
Smith, P. F.
Proceedings of the Florida State Horticultural Society 86, 95-99 (1973, publ. 1974) [8 ref. En] [USDA, Orlando, Florida 32803, USA]

Various combinations of boron and arsenic were applied to 'Marsh' grapefruit trees to determine the effect on acidity of the juice of maturing fruit. Boron increased the acidity. This occurred with both boric acid or sodium borate and with soil or foliar applications. Arsenic consistently decreased juice acidity by a small amount. This antagonistic effect was essentially the same when both elements were included in the same spray, applied in separate sprays, separated by a time interval, or when B was applied to the soil and As to the foliage. AS

9

[Atomic absorption determination of arsenic.]
Ebato, K.; Amakawa, E.; Yamanobe, H.; Suzuki, S.; Totani, T.
Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] 15 (6) 469-474 (1974) [9 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 3-24-1, Hyakunin-cho, Shinjuku-ku, Tokyo, Japan]

[Arsenic in raw materials and food products of marine origin.] [Review]
Markowski, B. J.
Zeszyty Centralnego Laboratorium Przemysłu Rybnego No. 24, 5-22 (1974) [20 ref. Pl] [Centralne Lab. Przemysłu Rybnego, Gdynia, Poland]

10

[Arsenic content of fish and fish products. (Preliminary results at March 1974).]
Markowski, B. J.; Ratkowska, J.
Zeszyty Centralnego Laboratorium Przemysłu Rybnego No. 24, 23-64 (1974) [2 ref. Pl] [Centralne Lab. Przemysłu Rybnego, Gdynia, Poland]

Values for As content determined by the Polish Standard PN-59/A-04010 method (reduction to arsine and colour reaction with mercury bromide) are tabulated for several samples each of raw and steamed sprat, herring, cod and mackerel as well as for large numbers of the solid portions of various canned fish products stored for 1-2.5 yr. The results are examined statistically and discussed in detail. Mean As contents of the 4 spp. named above were 2.5 mg/kg flesh without significant spp. differences. The mean As content of the canned products was 1.6 mg/kg with no significant differences between shad, herring, bream, mackerel, squid, sprat and sardine; canned hake and cutlassfish from the southern hemisphere contained only 0.56 mg/kg. >25% of the canned products contained >2 mg/kg, and 2.3% contained >5 mg/kg. It is pointed out that approx. 30% of the raw fish and 43% of the canned fish samples contained As in quantities above the accepted tolerance for food. SKK

11

[Review of methods for arsenic determination.]
Kijewska, U.; Ratkowska, J.
Zeszyty Centralnego Laboratorium Przemysłu Rybnego No. 24, 65-72 (1974) [3 ref. Pl] [Centralne Lab. Przemysłu Rybnego, Gdynia, Poland]

Several methods for As determination are described and the shortcomings of the Polish Standard PN-59/A-04010 method mandatory for fish products in Poland are enumerated. In view of the high As content of such products, the value of Lunde's method [FSTA (1973) 5 12R597] for separation of stable arseno-organic compounds from toxic inorganic As is stressed. SKK

12

[Possibility of arsenic compounds penetration from tin-plate cans into canned fish.]
Chrzanowski, S.; Krupa, A.
Zeszyty Centralnego Laboratorium Przemysłu Rybnego No. 24, 73-80 (1974) [Pl] [Centralne Lab. Przemysłu Rybnego, Gdynia, Poland]

According to Polish Standard PN-60/H-82204, Sn of 99.9% purity with a tolerance for As content of 0.015% or of 99.75% purity with a tolerance of 0.05% are used for tin-plate manufacture. On the basis of information from manufacturers and on the assumption of complete dissolution of the Sn plating, values for possible penetration of As into the fish contents are tabulated for 3 can sizes. For the Sn of lower purity, the values were (mg/kg can contents): 99 × 119 mm can, 0.244; 99 × 47 mm can, 0.322; and 99 × 26 mm can, 0.380. SKK

13

[Arsenic residues in livers of swine, lamb and poultry and in eggs.] Arsenrückstände in Leberproben von Schweinen, Lämmern und Geflügel sowie in Eiern
Knoppler, H.-O.
Zeitschrift für Lebensmittel-Untersuchung und -Forschung 157 (5) 277-280 (1975) [14 ref. De, en] [Tiergesundheitsdienst Bayern, Grub, Federal Republic of Germany]

The arsenic contents of 3651 swine livers, 180 lamb livers, 420 eggs and 175 poultry livers were determined colorimetrically. The samples were all obtained from Bavarian farms. According to the proposed legal standards in the Federal Republic of Germany, 1.23% of the swine liver samples and 1.67% of the egg samples contained more than the tolerance values of 0.5 and 0.1 mg/kg, respectively. AS

14

[Determination of As in wines and vinegars.]
Garrido, M. D.; Gil, M. L.; Llaguno, C.
Anales de Bromatología 26 (2) 167-175 (1974) [10 ref. Es, en] [Inst. de Fermentaciones Ind., Madrid, Spain]

The As contents of 3 samples of Spanish musts, 11 wines and 13 wine vinegars were determined by Vasak and Sedivec's method [Chemicke Listy (1952) 46, 341]; results are tabulated. Values for musts and commercial table wines were 0-0.03 mg/l., with 57% (8 samples) <0.01 ppm, and for wine vinegars were 0.0018-0.030 mg/l., with 48% (6 samples) <0.01 ppm. RM

15

The determination of arsenic and arsenicals. [Review]
Talmi, Y.; Bostick, D. T.
Journal of Chromatographic Science 13 (5) 231-237 (1975) [52 ref. En] [Analytical Chem. Div., Oak Ridge Nat. Lab., Oak Ridge, Tennessee 37830, USA]

Various accepted analytical procedures are briefly summarized and several new techniques are described, including sample pretreatment and dissolution, solution stability, preconcentration, isolation and determination. This general review includes procedures applicable to vegetation, animal tissue, drinking water, etc. AL

16

[Study of trace elements in foods. VIII. Simultaneous determination of lead and arsenic.]
Osajima, Y.; Sakane, Y.; Akuta, S.
Science Bulletin of the Faculty of Agriculture, Kyushu University 29 (4) 173-178 (1974) [Ja, en] [Lab. of Food Analysis, Fac. of Agric., Kyushu Univ., Fukuoka, Japan]

A method is described for simultaneous detn. of Pb and As by atomic absorption spectrophotometry. Recovery from citrus juice was 98.8% for Pb and 73.3% for As; error of the method is 1.42% for Pb and 2.0% for As. [From En summ.] AL

17

[Determination of arsenic in drinking water using silver diethyldithiocarbamate.]
Khristianova, L. A.; Udal'tsova, N. I.; Soldatova, S. S.
Gigiena i Sanitariya No. 1, 70-72 (1975) [Ru] [Nauchno-issled. Inst. Kommunalnogo Vodosnabzheniya i Ochistki Vody, Akad. Kommunalnogo Khozyaistva imeni K. D. Pamfilova, Moscow, USSR]

An apparatus for detn. of As by AsH_3 absorption in a pyridine solution of silver diethyldithiocarbamate is described and diagrammatically illustrated; the procedure is given in detail. 50-100 ml water containing 2-30 mg As are used and a battery of 10-15 apparatuses enables 10-15 detn. to be carried out in 2-2.5 h. The accuracy is ±10-15%. SKK

18

[Residues of arsenicals, nitrofurans, sulphonamides and chloramphenicol in the meat of slaughter animals.] Ergebnisse von Querschnittsuntersuchungen auf Arsenikalien, Nitrofurane, Sulfonamide und Chloramphenicol im Fleisch schlachtbarer Haustiere. [Thesis]
Jüntgen, H.-L.
177pp. (1973) [many ref. De] Hanover, Federal Republic of Germany; Tierärztliche Hochschule

An extensive literature review is presented of uses in animal production of antibiotics, chemotherapeutic agents, antiparasitic agents, sedatives and disinfectants; occurrence of residues in meat; possible allergic or toxic dangers; and loss of reactions of therapeutic value in man. A detailed investigation of frequency and extent of contamination by sulphonamides, nitrofurans, chloramphenicol and organic arsenicals is reported. Veal, beef and pork was examined from a total of 2101 animals slaughtered at 11 centres distributed throughout the Federal Republic of Germany, covering 5460 samples (liver, kidney, muscle tissues). Causes of inaccuracy of chemical methods (particularly with hepatic tissue) were studied. Individual substances were associated with particular organs, but renal tissue was the best source for all four. Max. frequencies were chloramphenicol in veal, sulphonamides in beef and nitrofurans in pork; max. individual residues recorded (ppm) were chloramphenicol 1.04, sulphonamides 3.76 and nitrofurans 1.63. Arsenic values were within the range of natural occurrence. Uncertainty of the methods prevented detailed evaluations, but neither frequency nor quantities of residues constituted a direct hazard to man. ELC

19

Arsenic and lead content of expressed Florida grapefruit oil as related to cultural sprays.
Kesterson, J. W.; Braddock, R. J.; Koo, R. C. J.; Reese, R. L.
HortScience 10 (1) 65-66 (1975) [5 ref. En] [Agric. Res. & Education Center, Univ. of Florida, Lake Alfred, Florida, USA]

Grapefruit is the only citrus fruit according to Florida law that can be legally sprayed with lead arsenate [$Pb_3(AsO_4)_2$], in order to accelerate fruit maturation. The effect of various maturation sprays as related to these trace metals was studied since definite tolerances for Pb and As have been established for citrus oils. It was found that As and Pb sprays applied to grapefruit (Citrus paradisi Macfad.) accelerate fruit maturity but do not contribute to the As and Pb content of the peel oil. The physicochemical properties of the expressed oils are influenced by this induced maturity but these changes would occur naturally during normal fruit maturation. AA

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H. BROOKES
ASSISTANT EDITOR

1

The use of instrumental neutron activation analysis for the determination of arsenic concentrations in poultry.
Bolton, B. A.; Hopke, P. K.
Journal of Radioanalytical Chemistry **25** (2) 299-302 (1975) [6 ref. En] [Dept. of Chem., St. Univ. Coll., Fredonia, New York 14063, USA]

Results of instrumental neutron activation analysis of As concn. in chicken tissue, egg and liver, and turkey liver, heart and kidney (values ranged from 0.03 to 0.29 ppm) indicate that levels of As below the mandatory max. levels can be measured. The method could be used for routine monitoring of As concn. in poultry products. AL

2

[Examination of pigs for pesticide and arsenic residues.] Untersuchung von Schlachtschweinen auf Pestizid- und Arsenrückstände.
Knöppler, H.-O.; Donnerbauer, H.-J.; Philipp, A.
Fleischwirtschaft **55** (10) 1460-1462 (1975) [12 ref. De, en, fr] [Tiergesundheitsdienst Bayern e.V., 8011 Grub bei München, Senator-Gerauer-Strasse 23, Federal Republic of Germany]

Residue analyses in Bavarian slaughterhouses showed chlorinated hydrocarbons in 3064 of 3731 belly fat samples. The main compound was hexachlorobenzene (HCB) and the tolerance of 0.5 mg/kg was exceeded 136 times (3.65%), with 20 samples containing 10.0-93.79 mg/kg. Liver, kidney and meat residues were considerably lower, with max. 1.13, 1.25 and 9.25 mg/kg respectively. Levels of other chlorinated hydrocarbons were within tolerance limits. As residues greater than the 0.25 mg/kg tolerance limit were found in 107 of 4811 livers (2.22.) with 24 samples from 2 suppliers containing 0.44-1.25 mg/kg 7 of 329 kidney samples (2.13%) contained 0.26-0.36 mg/kg. RM

3

[Determination of As in biological material by flame atomic absorption spectroscopy.]
Bestimmung von Arsen in biologischem Material mittels Atomabsorptionsspektralphotometrie.
Woidich, H.; Pfannhauser, W.
Zeitschrift für Analytische Chemie **276** (1) 61-66 (1975) [22 ref. De, en] [Forschunginst. der Ernährungswirtschaft, A-1190 Vienna XIX, Blaasstrasse 29, Austria]

A modified determination of As by means of AAS is described. AsH_3 generation is carried out in a reaction by addition of $NaBH_4$. The gas evolved is swept into a N_2-entrained air flame. The detection limit is 10 ng As. In the dry ashing step used for biological materials, $Mg(NO_3)_2$ is used as an ashing aid. It was found that an excess of 4 times of $Mg(NO_3)_2$ is necessary for finding all As present. An ashing temp. of 500°C is suitable. 2 h of ashing time is enough if the samples are carefully pre-ashed. Various foods were analysed, mainly all higher burdened species, i.e. 15 fish and shellfish species and products, cereal products, beverages. Highest concn. (ppm) were found in sea eels (11.6-29.6, mean 19.7), plaice (2.36-16.7, mean 8.5), shrimps (0.41-11.9, mean 8.6), cod fillets (2.05-10.25, mean 5.51) and sturgeon (0.66-12.23, mean 5.15). As contents in drinking water were also investigated. RM

4

Health food supplements prepared from kelp - a source of elevated urinary arsenic.
Walkiw, O.; Douglas, D. E.
Clinical Toxicology **8** (3) 325-331 (1975) [7 ref. En] [Toxicology Lab., Div. of Clinical Chem., Dep. of Med., Montreal General Hospital, Montreal, Canada]

Elevated urinary As levels in 2 female patients undergoing neurologic investigations were traced to their ingestion of health food supplements in tablet form prepared from kelp. Analysis of several such preparations openly available confirmed their significant As content (0.6-58.0 µg/g). Because of the widespread use of health food preparations, attention is drawn to this possibly unsuspected source of dietary As and to the possibility of adverse effects of prolonged daily ingestion of As in this apparently readily absorbable form. AS

5

[Analysis of heavy metals in fruit juices.] Beitrag zur Analytik des Schwermetallgehaltes von Fruchtsäften.
Bielig, H. J.; Dreyer, H.; Treptow, H.
Flüssiges Obst **42** (9) 369-375 (1975) [10 ref. De, en, fr] [Inst. für Lebensmitteltech., Tech. Univ., Berlin (West)]

The following mean values (µg/kg) are tabulated for As, Pb and Cd contents, determined by AAS using Perkin-Elmer equipment (number of samples in parentheses, metals in order stated above): apple juice, clear (16) 25.0, 40 and 7.7; apple juice, cloudy (10) 22.3, 38 and 8.2; apricot juice (1) 26, 36 and 10; pear juice (1) 32, 11 and 8; grapefruit juice (7) 24.3, 86 and 8.2; redcurrant juice (1) 20, 30 and 5; blackcurrant juice (21) 24.0, 46 and 8.1; cherry juice (20) 26.3, 36 and 8.1; orange juice (14) 30.6, 31 and 8.9; grape juice, red (18) 43.8, 101 and 9.2; grape juice, white (16) 41.4, 96 and 9.2; plum juice (1) 30, 15 and 9; blackcurrant mother-juice (1) 21, 28 and 9; cherry mother-juice (2) 30, 33 and 8; blackcurrant juice, 6-fold concentrate (1) 116, 220 and 80; and cherry juice, 6-fold concentrate (1) 146, 190 and 9.2. Hg contents of all unconcentrated juices tested above were <5 µg kg; and for the 2 concentrates, they were 10 and 8, respectively. SKK

6

Isolation of an organoarsenic compound present in cod liver.
Lunde, G.
Journal of the Science of Food and Agriculture **26** (9) 1247-1255 (1975) [20 ref. En] [Cent. Inst. for Ind. Res., Oslo, Norway]

By methods based on ion exchange, liquid extraction, gel filtration and TLC, and extract of marine origin was prepared that contained close to

100% (on dry wt. basis) of a water-soluble organoarsenic compound. As starting material an aqueous extract prepared by enzymic hydrolysis of defatted cod liver was used. The As compounds was further characterized by IR and UV spectroscopy. Attempts were also made at making derivatives of the compound. The organoarsenic compound has a strong absorption at about 260 nm. It also has an IR spectrum showing aromatic characteristics and hydroxyl and amino functions. By reaction with bistrimethylsilyltrifluoracetamide (BSTFA) the water-soluble organoarsenic compound is converted to a compound that is soluble in organic solvents. By methylating (dimethylformamide-diethylacetal) the compound becomes less polar, but is still partly soluble in water. AS

7

A comparison of organoarsenic compounds from different marine organisms.
Lunde, G.
Journal of the Science of Food and Agriculture **26** (9) 1257-1262 (1975) [11 ref. En] [Cent. Inst. for Ind. Res., Oslo, Norway]

Organic bound As was enriched in aqueous extracts prepared from marine raw materials [fish, shellfish, squid, seaweed]. The extracts were chromatographed in 4 different TLC systems. All extracts prepared by boiling and enzymic hydrolysis of heat-treated and fresh raw material contain 1 major organoarsenic compound with the same TLC behaviour in all systems. Aqueous extracts prepared from oil from seaweed and from fish and treated with constant boiling HCl also contain 1 compound with identical bheaviour in all TLC systems. The chromatographic behaviour of the latter organoarsenic compound is, however, different from that of the organoarsenic compound in the aqueous extract. AS

8

[Photometric determination of arsenic in biological material.] Photometrische Arsenbestimmung in biologischem Material.
Woidich, H.; Pfannhauser, W.
Zeitschrift für Lebensmittel-Untersuchung und - Forschung **159** (6) 323-327 (1975) [11 ref. De, en] [Forschungsinst. der Ernährungswirtschaft, Vienna, Austria]

A modification of the silver diethyldithiocarbamate (SD) method of Vasak & Sedivec [Chemicke Listy (1952) **46**, 341] for detn. of As is described in detail. The main alteration consists in using as SD solvent hexamethylenetetramine/chloroform (500 mg and 100 ml respectively for 100 mg SD). The colour of As complex with SD remains stable under these conditions. The detection limit of the method is 0.5 µg As. The following values with ranges (ppm) are quoted (numbers of samples in parentheses): shellfish (13) 0.84, 0.59-1.21; cod liver (10) 0.82, 0.25-1.80; shrimps (6) 3.19, 1.04-4.93; octopus (4) 1.01, 0.26-2.05; tuna (3) 0.69, 0.17-1.44; Brathering (fried preserved herring) (1) 0.13; plaice (1) 12.44; cod (1) 7.29; rainbow trout (1) 1.27; saithe (1) 0.27; mackerel (1) 1.63; herring (1) 1.43; rice (1) 0.22; and dried morel (Baummorchel) (1) 0.91. SKK

9

[Arsenic - contents and effects in soils and plants.] Arsen Gehalte und Wirkungen in Böden und Pflanzen.
Schönhard, G.; König, W.
Zeitschrift für Pflanzenkrankheiten und Pflanzenschutz **82** (5) 327-336 (1975) [many ref. De] [Biol. Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem, D-1000 Berlin 33, Königin-Louise-Strasse 19]

The literature on As detected in soils and in fruits and vegetables is reviewed in view of the high value reported. In fruits and vegetables grown on untreated soil, reported values were 0.01-0.50 ppm (except for high values reported in wine yeast). In produce treated with As sprays, values ranged from 0.01 to 2.58 ppm (apples sprayed 2-3 times with lead arsenate). RM

10

Organic arsenic in rock lobsters not harmful.
Anon.
Australian Fisheries **34** (12) 23 (1975) [En]

A table of data (max. and min. values) is given for total As concn. in various Australian spp. of edible fish, crustacea and molluscs. Rock lobster meat had the highest As concn. of the samples studied (≤91.0 ppm, wet wt. basis). Most of this As is, however, organically bound, and therefore presents no significant health hazard. AJDW

11

Pesticide residues in the total diet in Canada. III. 1971.
Smith, D. C.; Leduc, R.; Charbonneau, C.
Pesticide Science **4** (2) 211-214 (1973) [3 ref. En] [Health Protection Branch, Dep. of Nat. Health & Welfare, Tunney's Pasture, Ottawa, Ontario, Canada]

Foods, representing an average Canadian diet, were cooked, grouped by type of product and made into composites which were then analysed for organochlorine and organophosphorus pesticides and As. The amounts found were at a consistently low level and would contribute approx. 22 µg total pesticide residues and 25 µg As/person/day. [See Pesticide Science (1972) **3**, 207 for previous part.] AS

12

Pesticide residues in the total diet in Canada. IV. 1972 and 1973.
Smith, D. C.; Leduc, R.; Tremblay, L.
Pesticide Science **6** (1) 75-82 (1975) [7 ref. En] [Health Protection Branch, Health and Welfare Canada, Tunney's Pasture, Ottawa, Ontario, Canada]

Foods, representing an average Canadian diet, were prepared for eating, made into homogenized composites each containing one type of produce and analysed for pesticide residues and As. Amounts found were at a consistently low level which could contribute about 20 µg total pesticide residues and 35 µg As/person/day. RM

13

[The arsenic content of foods at consumer level.] [Lecture]
Guatelli, M. A.; Gallego Gandara de Fernicola, N. A.; Neira Rodriguez, M. M.; Franchetti, E. P.
Anales de Bromatologia **25** (3) 321-325 (1973) [8 ref. Es, en] [Fa. de Farmacia y Bioquimica, Univ. de Buenos Aires, Argentina]

Analysis of a large number of foods revealed only 2 foods of plant origin with traces of As (i.e. 0.005 ppm in peeled apple, 0.007 ppm in asparagus), and 5 samples of chicken liver and 1 of chicken heart with 0.056-0.55 ppm. RM

14

[Determination of As in foods.]
Gherardi, S.; Aglio, G. dall'; Versitano, A.
Industria Conserve **50** (4) 284-288 (1975) [11 ref. It, de, en, fr] [Sta. Sperimentale per l'Ind. delle Conserve Alimentari, Parma, Italy]

A sensitive, accurate and quick method for As detn. is described: As is reduced to AsH_3 with $NaBH_4$, followed by combustion in Ar/H_2 flame and detn. by AAS. 90-110% recoveries were obtained from 0.1 ppm As in 10 g samples, though 0.05 ppm can be determined with reasonable accuracy. Accurate and reproducible results were obtained by digestion of samples in HNO_3-H_2SO_4 and incineration with $Mg(NO_3)_2.6H_2O$. As levels found were (ppm): <0.1 in fresh fruit and fruit products; 0.01-0.6 in milk, eggs and canned meat; 0.123-0.62 in canned mussels; and 1.28-6.44 in dogfish, shark and tuna. Since about 90% of the As in marine products is present as stable organic compounds, its toxicity is much lower than it appears from concn. levels. RM

15

[Extraction and photometric determination of small amounts of arsenic in vegetables and canned vegetables.]
Mikhailova, N. V.; Litvinova, V. D.; Radomskaya, L. G.; Solov'eva, E. I.
Konservnaya i Ovoshchesushil'naya Promyshlennost' No. 10, 36-38 (1975) [2 ref. Ru] [Ukrainskii Nauchno-issled. Inst. Pishchevoi Promyshlennosti, USSR]

The inadequacy of the existing colorimetric methods of detn., based on the arsenic trihydride/mercury dibromide or arsenic trihydride/silver nitrite reaction is emphasized. The newly proposed technique consists in extracting the As from a HCl solution of the ashed plant material by means of tetrachlor methane; further extraction is made with water. The photometric detn. is based on a sensitive colour reaction by formation of a reduced As-Mo complex; the reducing agent is ascorbic acid in the presence of potassium antimonate. Tests were made of possible interference by phosphates; when less than 68.4 mg P is present in the test solution, no substantial effect is produced. A 20-50 g sample of vegetable is decomposed (in dry condition) by heating with MgO at 150-200°C for 2-3 h, followed by decomposition with Mg nitrate at 550°C/2 h. After complete reduction of As^{5+} to As^{3+} the extraction with CCl_4 follows. The sensitivity is 2 µg As/50 g sample, if 0.04 mg As is present in 1 kg. The ashing procedure takes 7-8 h, which is 5-6 times quicker than wet decomposition. The post-ashing analysis takes 2-2.5 h. STI

16

National Marine Fisheries Service preliminary survey of selected seafoods for mercury, lead, cadmium, chromium, and arsenic content.
Zook, E. G.; Powell, J. J.; Hackley, B. M.; Emerson, J. A.; Brooker, J. R.; Knobl, G. M., Jr.
Journal of Agricultural and Food Chemistry **24** (1) 47-53 (1976) [14 ref. En] [Southeast Util. Res. Cent., Nat. Marine Fisheries Service, Nat. Oceanic & Atmospheric Administration, US Dep. of Commerce, College Park, Maryland 20740, USA]

A preliminary screening study was conducted on Hg, Pb, Cd, Cr and As contents of 34 commonly consumed seafoods. 334 samples were analysed and, in general, 10 samples/species were obtained from a location. >96% of the samples fell below the FDA guideline of 0.5 ppm for Hg, with a mean level of 0.13 ppm. Mean Pb values among species tended to be rather uniform and only a few species averaged >0.6 ppm. No species mean exceeded 1 ppm. Cd content of most seafoods averaged <0.2 ppm. Cr was present at <0.4 ppm in all species. Arsenic levels showed the widest variation and were higher for some species than the other elements tested. Some possible relationships between elements within each species were encountered, but the data were too limited to draw firm conclusions. AS

17

[Hygienic chemical studies on harmful elements. V. Contents of heavy metals in vegetables and fruits.]
Amemiya, T.; Ito, K.; Yamazoe, R.; Harada, H.; Totani, T.
Annual Report of Tokyo Metropolitan Research Laboratory of Public Health **25**, 127-132 (1974, publ. 1975) [18 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3

chome, Shinjuku-ku, Tokyo 160, Japan]

A survey was made in 1971-1973 of the contents of Cd, Pb, As, Cu, Zn and Mn in tomato, cucumber, spinach, potato, tea, apple, strawberry and summer orange collected from retail outlets. The samples were digested with sulphuric and nitric acids. The elements were then determined in the digested solution by spectrophotometry, using silver diethyldithiocarbamate and AAS. Ranges and mean values for the 3 yr are tabulated [in English]. [From En summ.] [See FSTA (1973) 5 3C76 for part II.] JA

18

[Testing of spices and condiments. Determination of arsenic. Photometric method.] Prüfung von Gewürzen und Zutaten. Bestimmung von Arsen. Photometrisches Verfahren.

Germany, Federal Republic of, Deutscher Normenausschuss

German Federal Republic Standard **DIN-10226**, 3pp. (1974) [De]

A comminuted sample of the material under test is digested with HNO_3 and H_2SO_4. The As is then converted to the chloride by addition of HCl, and the $AsCl_3$ is separated by distillation. The $AsCl_3$ is then converted to AsH_3 by reaction with KI + $ZnCl_2$ solution and Zn metal. The AsH_3 is then distilled off and collected in silver diethyldithiocarbamate solution; coloration of this solution is then evaluated by spectrophotometry at 540 nm, and the As concn. is calculated. AJDW

19

Determination of arsenic and selenium in foods by electroanalytical techniques.

Holak, W.

Journal of the Association of Official Analytical Chemists **59** (3) 650-654 (1976) [12 ref. En] [FDA, 850 Third Avenue, Brooklyn, New York 11232, USA]

As and Se are determined in foods by differential pulse polarography and cathodic stripping voltammetry. The sample is digested with HNO_3 and magnesium nitrate and then dissolved in dilute HCl. An aliquot is removed, and the As is chemically reduced to the trivalent state, and interferences are removed by ion exchange before polarography. Se is determined in a second aliquot by cathodic stripping voltammetry. Recoveries for both elements in several foods (including eggs, fish, frankfurters and oranges) were from 90 to 110%. The relative SD for As at 5 ppm and Se at 0.48 ppm were 5.8 and 7.3%, respectively. AS

20

Acidification of calcium arsenate sprays.

Gilfillan, I. M.; Wahl, P.; Holmden, E.; Reay, N.; Stevenson, J. A.

Citrus and Sub-Tropical Fruit Journal No. 508, 5-9, 11 (1976) [6 ref. En, af] [Outspan Citrus Cent., SA Co-op Citrus Exchange, PO Box 28, Nelspruit, South Africa]

Acid level of Marsh grapefruit in the Sundays River Valley remains at a high level throughout the packing season. Values of ≥2% are common. Such acid levels are too high and develop consumer resistance. The use of arsenical sprays to lower the acid level is re-evaluated. Investigations were carried out into the effect of sprays on fruit internal quality, fruit size and As residue levels. The most effective and safe treatment was found to be 75 g calcium arsenate/100 l. ($\frac{3}{4}$ lb/100 gal) acidified to pH 4 with H_2SO_4 on grapefruit. On Valencias a concn. of 50 g calcium arsenate arsenate acidified to pH 4 with H_2SO_4 is sufficient. The very slight phytotoxicity and slight fruit size reduction may possibly be eliminated by more frequent irrigation than is normal at present. The greatest proportion of As residue was in the peel and there was no difference between the As concn. in the pulp of treated and untreated fruit. Reduction from 1 5-6 wk internal between irrigation turnus to a 3 wk internal between Nov. and July gave an average fruit size increase of 3.0 mm and an average acid level reduction of 0.23%. VJG

21

Acidification of calcium arsenate sprays in non-saline areas.

Gilfillan, I. M.; Stevenson, J. A.

Citrus and Sub-Tropical Fruit Journal No. 508, 13-14 (1976) [1 ref. En, af] [Otspan Citrus Cent., SA Co-op Citrus Exchange, PO Box 28, Nelspruit, South Africa]

The following treatments: (i) 150 g calcium arsenate per 100 l., with no spray pH adjustment; (ii) 50 g calcium arsenate per 100 l., spray pH adjusted to 4 with H_2SO_4; (iii) 50 g calcium arsenate per 100 l., spray pH adjusted to 4 with phosphoric acid; (iv) control, no arsenical spray, were applied to Marsh grapefruit and Valencia oranges growing on non-saline conditions. Results for (i), (ii), (iii) and (iv) treatments respectively were: grapefruit - TSS (%), 8.2, 8.5, 8.5, 8.3; acid (%), 1.28, 1.12, 1.15, 1.48; mean fruit diam (mm), 91.8, 91.7, 91.9, 92.1; Valencias - TSS (%), 10.5, 10.6, 10.5, 10.5; acid (%), 1.15, 0.90, 0.95, 1.58; mean fruit diam. (mm) 67.1, 67.5, 67.5, 67.9. For Valencias the treatments had no effect on fruit size. Acid levels were reduced by (i) and even more by (ii) and (iii). It is probably preferable to use (ii) than (iii) since phosphoric acid is known to be phytotoxic under certain circumstances. [See also preceding abstr.] VJG

22

[Influence of treatment with lead arsenate on the arsenic content of apples.]

Hamelle, G.; Bressolle, F.; Mattras, H.

Annales des Falsifications et de l'Expertise Chimique **69** (738) 197-208 (1976) [Fr] [Lab. de Chimie Analytique et de Toxicologie, Fac. de Pharmacie, Montpellier, France]

Examination of French apples harvested in 1972 showed that spraying the trees with lead arsenate

resulted in the washed fruit containing 0.016-0.366 mg As/kg french wt. (0.128-2.93 mg As/kg DM). 43% of the apples tested contained more than the permitted level of 1 mg As/kg DM. Most of the As in the fruit was localized in the skin. Fruit from untreated trees contained <0.08 mg As/kg DM. Since 1973 the use of lead arsenate for spraying fruit trees has been banned in France. MEG

23

Arsenical pesticides. A symposium sponsored by the Division of Pesticide Chemistry at the 168th Meeting of the American Chemical Society, Atlantic City, New Jersey, Sept. 9, 1974.
[Conference proceedings]
Woolson, E. A. (**United States of America**, American Chemical Society) (Editor)
vii + 176pp. ISBN 0-8412-0243-5 (1975) [many ref. En] Washington, DC, USA Price $12.50

This book, No. 7 in the ACS Symposium Series under the editorship of R. F. Gould, contains 10 papers: Review of arsenical pesticides, by S. A. Peoples (pp. 1-12, 18 ref.); The determination of traces of arsenic: a review, by Y. Talmi & C. Feldman (pp. 13-34, 167 ref.); Behavior and phytotoxicity of inorganic arsenicals in soils, by L. M. Walsh & D. R. Keeney (pp. 35-52, 62 ref.); Behavior of organoarsenicals in plants and soils, by A. E. Hiltbold (pp. 53-69, 32 ref.); Arsenicals in animal feeds and wastes, by C. C. Calvert (pp. 70-80, 23 ref.); Microbiological methylation of arsenic, by D. P. Cox (pp. 81-96, 21 ref.); Bioaccumulation of arsenicals, by E. A. Woolson (pp. 97-107, 37 ref.); Arsenic in the environment, by R. S. Braman (pp. 108-123, 17 ref.); A proposed arsenic cycle in an agronomic ecosystem, by G. R. Sanberg & I. K. Allen (pp. 124-147, 81 ref.); and Simulation of the mobility of arsenic compounds in the environment: a Southern Texas case study, by J. E. Stolzenberg (pp. 148-171, 81 ref.). AL

24

Levels of toxic metals in marine organisms collected from Southern California coastal waters.
Fowler, B. A.; Fay, R. C.; Walter, R. L.; Willis, R. D.; Gutknecht, W. F.
Environmental Health Perspectives No. 12, 71-76 (1975) [12 ref. En] [Environmental Toxicology Branch, Nat. Inst. of Environmental Health Sci., Res. Triangle Park, N. Carolina 27709, USA]

Emission of toxic trace metals into S. California coastal waters has resulted in their extensive accumulation within marine sediments. This study evaluated concn. of trace metals in bottom-dwelling marine fauna collected from 2 sampling areas. Analysis of muscle samples of Dover sole (Microstomus pacificus) and crab (Cancer anthonyi) by proton-induced X-ray emission analysis showed considerable concn. of As and Se. Samples of gonads, digestive gland, and muscle from the crab Mursia gaudichaudii analysed by AAS showed elemental concn. in muscle similar to the crab Cancer anthonyi and much higher metal levels in gonad and digestive gland. AS

25

Effects of selenium, cadmium, mercury, tellurium, arsenic, silver and cobalt on white muscle disease in lambs and effect of dietary forms of arsenic on its accumulation in tissues.
Whanger, P. D.; Weswig, P. H.; Schmitz, J. A.; Oldfield, J. E.
Nutrition Reports International 14 (1) 63-72 (1976) [27 ref. En] [Dep. of Agric. Chem., Oregon State Univ., Corvallis, Oregon 97331, USA]

This paper on effects of addition of Cd, Hg, As, Te, Co or Ag to low-Se diets fed to ewes on the incidence of white muscle disease in their lambs includes data for As concn. in edible tissues of the lambs of ewes fed As-supplemented diets. The results show that supplementation of the ewes' diet with As as As_4O_6 caused no significant As accumulation in the tissues. Supplementation with Na_3AsO_4 resulted in significant increases in As concn. in the liver and kidney, but not in muscle. Mean values for As concn. in tissues of 6-wk-old lambs (for progeny of ewes receiving a non-supplemented diet or a Na_3AsO_4 supplemented diet respectively) (ppm wet basis) were: liver 0.022 and 0.039; kidney 0.027 and 0.161; and muscle 0.026 and 0.027. AJDW

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H. BROOKES
ASSISTANT EDITOR

1

[Determination of arsenic in food wrapping paper.]
Scrima, M.; Polidori, G.
Bollettino dei Laboratori Chimici Provinciali **27** (1) 58-64 (1976) [5 ref. It, de, en, fr] [Lab. Chimico Provinciale di Pesaro, Pesaro, Italy]

An original method for quantitative detn. of As in food wrapping paper is described. The method uses a novel technique for digesting organic matter. Good reproducibility and recovery were obtained with 5 different types of paper (including waxed paper) containing 0.20-1.15 ppm As, and with 1 type of waxed paper containing 0-8 µg added As. RM

2

[The determination of microamounts of arsenic in fats and oils by absorption spectrophotometry.]
Hirayama, H.; Shimoda, Z.; Noguchi, C.; Kobayashi, A.; Shige, T.; Takahashi, T.; Tsuji, K.; Nakasato, S.; Higuchi, M.; Murui, T.; Yamakawa, Y.; Yamashita, T.; Yamashita, M.; Yoshida, J.
Journal of Japan Oil Chemists' Society [Yukagaku] **25** (5) 275-280 (1976) [4 ref. Ja, en] [Japan Oilstuff Inspectors Corp., 3-25-2, Hyakunincho, Shinjuku-ku, Tokyo, Japan]

A rapid and precise method for detn. of micro amounts of As in fats and oils was studied. Samples were decomposed by wet digestion with H_2SO_4 and H_2O_2 (30%) and As in the decomposed solution co-precipitated as complexes with ferric hydroxide. The co-precipitate was reduced to gaseous arsine (AsH_3) by Zn in acid medium and AsH_3 gas absorbed into a solution of silver diethyldithio carbamate dissolved in pyridine. Absorbance of the AsH_3 solution was measured at about 530 nm. The most suitable pH for As co-precipitation was about 9. Collaborative recovery and reproducibility studies on samples of soybean oil with 2.5, 3.0, 6.0 and 7.5 µg As/5 g oil gave mean 83.7-97.2% recoveries, SD 0.43-1.18 and coeff. of variation (CV) 18.6-25.6%, although CV as low as 3.8-9.5% was found in 8 replicates containing 2.5 µg/5 g oil. RM

3

The spectrophotometric determination of arsenic in sea water, potable water and effluents.
Haywood, M. G.; Riley, J. P.
Analytica Chimica Acta **85** (2) 219-230 (1976) [25 ref. En] [Dep. of Oceanography, Univ., PO Box 147, Liverpool L69 3BX, UK]

The sample evolves arsine when treated at a controlled rate with sodium borohydride; this is absorbed in an iodine solution, and the resultant arsenate is determined photometrically by a molybdenum blue method. Range, SD, and detection limit are 0-800 µg/l., about 1% (at 20 µg/l. level) and 0.5 µg/l. respectively, for potable water. Interference from Ag, Cu, Ni, Cd and Bi can be avoided by additional steps, and organic As may also be determined if rendered reactive. As (V) and As (III) can be separately determined if desired. JRR

4

Influence of organic arsenical herbicides on yield and quality of sugarcane. [Lecture]
Cossio, R. P.
Proceedings of the International Society of Sugar Cane Technologists Vol. 2, pp. 809-819 (1974) [16 ref. En, es] [Agric. Exp. Sta., Tucuman, Argentina]

Effects of organic arsenical herbicides on yield and quality of sugarcane were studied. Treatments tested were: disodium methyl arsenate at 3.0 or 5.2 kg/ha, or a 71.9% solution of monosodium methyl arsenate at 3.0 l./ha. Data are given for cane quality (Brix %, polarization, juice purity, pol % juice, pol % cane) and for residual As concn. in the juice and the bagasse. In general, the herbicide treatments slightly reduced cane quality. Treatment with arsenical herbicides at the doses studied significantly increased As concn. in the bagasse and juice; As concn. remained above normal levels for approx. 5 months after treatment. [See FSTA (1977) 9 2L105.] AJDW

5

[Determination of arsenic in dried milk by atomic absorption spectrophotometry.]
Kenjo, N.; Asotani, Y.; Noda, K.; Takahashi, T.
Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] **17** (2) 204-208 (1976) [4 ref. Ja, en] [Res. Inst., Meiji Milk Products Co. Ltd., Sakaecho, Higashi-Murayama, Tokyo, Japan]

About 1 g of sample was dry-ashed at about 600°C in the presence of Mg salts to prevent sublimation of As. The ashes were dissolved in HCl and the arsenate converted to arsine gas by reaction with KI, $SnCl_2$ and Zn powder. The arsine gas was determined by AAS. The As content of commercial dried milk, measured by this method, was 0.05-0.13 ppm. TM

6

The unexpectedly high levels of arsenic found in some foods and beverages.
Deeley, S.; Vitek, R. K.; Bors, J. J.; Houser, W. C.
Abstracts of Papers, American Chemical Society **172**, ANAL 156 (1976) [En] [West Allis Memorial Hospital, 8901 W. Lincoln, W. Allis, Wisconsin 53227, USA]

Arsenic in organic materials is frequently undetected or grossly underestimated, since frequently a digestion is required to release it from organically bound states for atomic absorption analysis. A wet digestion employing H_2SO_4, HNO_3 and H_2O_2 yields quantitative results. Without digestion, only 2-5% of the As is recovered for analysis. The US Public Health Service has set safe and max. As concn. in drinking water at 10 and 50 µg/l., respectively. Since significant amounts of As are present in the environment in methylated forms, total As levels exceeding the max. may sometimes be undetected. Using an improved As recovery technique, it is demonstrated that some

wines contain >200 µg As/l., and some juices 100 µg/l. Relatively high levels of As have been observed in various other foods and in cotton plant residues fed to cattle awaiting slaughter. AS

7

Colorimetric method for the determination of arsenic(III) in potable water.
Sandhu, S. S.
Analyst **101** (1208) 856-859 (1976) [11 ref. En] [Water Lab., S. Carolina State Coll., Orangeburg, S. Carolina 29117, USA]

A colorimetric method was developed for detn. of As^{3+} in potable water at concn. of 0.002 mg/l. As^{3+} reacts quantitatively with potassium iodate in the presence of H_2SO_4 and releases an equivalent amount of I which imparts a pink colour to a carbon tetrachloride extract; the colour is measured at 520 nm. The method was used to differentiate between As^{3+} and As^{5+}. No interference was observed from added As^{5+}, chloride, fluoride or nitrate; recovery of As^{3+} was 95-105% (average 98.3%). 80% of natural waters analysed showed trace amounts of As^{3+}; drinking waters from fountains contained less than river waters. As^{5+} was detected in all the natural water samples, but at concn. below the mandatory limit. AL

8

Methylated arsenic from marine fauna.
Edmonds, J. S.; Francesconi, K. A.
Nature, UK **265** (5593) 436 (1977) [9 ref. En] [W. Australian Marine Res. Lab., PO Box 20, North Beach, W. Australia 6020, Australia]

Mussels (Mytilus edutis planulatus Lamarck), western rock lobster (Panulirus longipes cygnus George) and stingray (Dasyatis thetidis Waite) were found to contain dimethylated and trimethylated As, together with a small proportion of inorganic As. It seems that most As in such situations is organically bound and probably nontoxic. AL

9

[Determination of As in foods of animal origin.]
Maggi, E.; Campanini, G.; Bracchi, P. G.; Bagnoli, R.
Atti della Societa Italiana delle Scienze Veterinarie **29**, 577-580 (1975) [24 ref. It, en, fr] [Istituto di Ispezione degli Alimenti di Origine Anim., Univ. di Parma, Parma, Italy]

As was determined by AAS in a total of 310 samples of foods of animal origin. Mean values (with number of samples in parentheses) were (parts/billion, fresh wt. basis): frozen beef (40) 16.1; fresh beef (21) 8.3; beef liver (21) 10.3; pork (24) 6.5; pork liver (30) 9.2; chicken muscle (18) 9.6; chicken liver (24) 8.6; turkey muscle (15) 11.0; rabbit muscle (16) 20.2; stewed beef (33) 13.5; meat pies (12) 20.8; prepared foods (26) 23.6; and eggs (30) 8.5. It is concluded that As levels in these foods present no significant health hazard. AJDW

10

[Determination of arsenic in wines and flavoured alcohlic beverages.]
Ulian, F.; Chialva, F.; Gabri, G.
Industrie delle Bevande **6** (1) 73-76 (1977) [10 ref. It] [Lab. Ricerche Martini & Rossi SpA Torino, Stabilimento di Pessione, Turin, Italy]

A modification of the OIV colorimetric method for detn. of As in wines and flavoured alcoholic beverages, e.g. vermouth, is described. The modification involves use of H_2O_2 and spectrophotometric analysis at 560 nm in place of the HNO_3 and 545 nm used in the original method. Very close agreement in the As concn. determined was found when 12 samples were analysed by the original and modified techniques. Advantages claimed for the modification are elimination of toxic HNO_3 fumes, elimination of the 2nd evaporation phase required in the original, and elimination of potential errors caused by nitrous compounds. HBr

11

[Determination of traces of heavy metals in aroma compounds.]
Palliere, M.; Gernez, G.
Annales des Falsifications et de l'Expertise Chimique **69** (747) 821-832 (1976) [10 ref. Fr] [Rhone-Poulenc Ind., Cent. Nicolas-Grillet, 13 Quai Jules-Guesde, 94400 Vitry-sur-Seine, France]

Methods are described for detn. of As, Cd, Pb and Hg in flavourings. 2 methods are proposed for each element: a sensitive accurate AAS method (limits of detection 0.010 ppm for As and Cd, 0.050 ppm for Hg and Pb) and a simple screening method (limits of detection 1 ppm for As, 2 ppm for Cd, 5 ppm for Pb; no simple method for Hg). Application to vanilla, coffee, apricot, peach, onion and strawberry essence achieved ⩽90% recovery. A modified Pien apparatus for careful wet ashing, and apparatus for producing volatile hydrides prior to AAS (e.g. AsH_3) is described with the aid of diagrams. RM

12

[Wines. Determination of arsenic.]
Romania, Institutul Roman de Standardizare
Rumanian Standard STAS 6182/28-73, 9pp. (1973) [Ro]

This standard prescribes 2 methods for detn. of As in musts and wines: (i) based on conversion of As to AsH_3 which is then reacted with silver dithiocarbamate to give a pink derivative which may be determined by optical density measurements at 545 nm; and (ii) a Gutzeit method, based on conversion of the As to AsH_3, which is then reacted with mercuric chloride to give a yellow-brown derivative, the intensity of coloration of which is evaluated visually by comparison with standards. Sensitivity of (i) is 0.5 µg As; that of (ii) is 0.25 µg As. (i) is obligatory in cases of litigation. AJDW

13

[Investigation of arsenic contamination of soil and ground water.] Untersuchung einer Arsen-Verunreinigung im Boden und Grundwasser.
Horvath, A.
Zeitschrift fuer die Gesamte Hygiene und ihre Grenzgebiete **22** (10) 731-734 (1976) [7 ref. De, en, ru] [Staatliches Inst. für Hygiene, Budapest, Hungary]

A case of contamination of soil and ground water with As in an agricultural district in Hungary is described; the As originated from As-containing plant protection agents. Some soil strata contained 100 ppm, some ground water samples exceeded the WHO recommended limit (0.05 mg As/l.). The likelihood of prolonged As contamination of well water is considered, together with the possibility of further spread of As contamination as a result of ground water flow. IN

14

Arsenic concentrations in some coexisting marine organisms form Newfoundland and Labrador.
Kennedy, V. S.
Journal of the Fisheries Research Board of Canada 33 (6) 1388-1393 (1976) [17 ref. En, fr] [Dep. of the Environment, Fisheries & Marine Service, Biol. Sta., St. John's, Newfoundland A1C 1A1, Canada]

Inorganic As concn. in sea water and mud, and total As concn. in bodies of shrimp, zooplankton, and fish from northern Newfoundland and southern Labrador were measured. There was a positive relationship between concn. and carapace length in Pandalus borealis and P. montagui and a negative relationship in Eualus macilentus. There was no relationship between concn. in shrimp eggs and carapace length. As concn. in zooplankton and fish muscle were relatively low compared with the shrimp spp.; amphipods contained more As than copepods or euphausiids, and American plaice (Hippoglossoides platessoides) more than redfish (Sebastes marinus), turbot (Reinhardtius hippoglossoides), and Atlantic cod (Gadus morhua). There was no evidence of increasing As concn. through successively higher levels of the food chain. AS

15

[Fruit, vegetables and fruit and vegetable products. Determination of arsenic.]
France, Association Francaise de Normalisation (AFNOR)
French Standard NF V 05-120, 7pp. (1976) [Fr]

A method for detn. of As in fruit and vegetable products is specified, based on wet-ashing of the sample with H_2SO_4, HNO_3 and $HClO_3$, reduction of As^{5+} to As^{3+} by means of $SnCl_2$, conversion of As^{3+} to AsH_3 by reaction with nascent H, reaction of the AsH_3 with silver diethyl dithiocarbamate, and spectrophotometric detn. of the extinction value of the resulting solution at 525 nm. Instructions are given for calculation of the As concn. by means of standard curves. AJDW

16

[As contamination of animal products in Bacs-Kiskun county.]
Szakolczai, J.
Magyar Allatorvosok Lapja 32 (4) 253 (1977) [Hu]

This letter, which follows an article on As contamination of groundwater, reports As contents determined in 1973, 1974 and 1975 for 31 samples of water, eggs, cows' milk and cows' hair from 6 districts of Bacs-Kiskun county, Hungary. In the 6 milk samples, As content was 0.04, 0.05, 0.1, 0.03, 0.04 and 0.04 mg/1000 g. In the 5 egg samples, it was 0.1, 0.05, 0.1, 0 and 0.05 mg/1000 g. ADL

17

Determination of sub-microgram per liter quantities of arsenic in water by arsine generation followed by graphite furnace atomic absorption spectrometry.
Shaikh, A. U.; Tallman, D. E.
Analytical Chemistry 49 (8) 1093-1096 (1977) [12 ref. En] [Dep. of Chem., N. Dakota State Univ., Fargo, N. Dakota 58102, USA]

The As in a large vol. (50 ml) of water sample is subjected to $NaBH_4$ reduction and the liberated arsine is trapped in a small vol. of a chloroform/ephedrine solution of silver diethyldithiocarbamate (SDDC). The As in the SDDC solution is then determined by graphite furnace AAS. The relative SD for 10 replicate detn. is $<3\%$ at the 5 μg/l. level. A detection limit of 10 ng is obtained, corresponding to 0.2 μg/l. for a 50-ml water sample. The detection limit can be extended to below 0.05 μg/l. by employing a larger vol. of water sample and by evaporation of solvent from the SDDC solution as a means of further preconcentration. The relative accuracy of the method at the 5 μg/l. level is better than 5% as determined from the analysis of the USA Environmental Protection Agency reference samples. AS

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FAB 40

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H. BROOKES

ASSISTANT EDITOR

1

Analysis of foods for arsenic and selenium by acid digestion, hydride evolution atomic absorption spectrophotometry.

Inhat, M.; Miller, H. J.

Journal of the Association of Official Analytical Chemists 60 (4) 813-825 (1977) [52 ref. En] [Agric. Canada, Chem. & Biol. Res. Inst., Ottawa, Ontario K1A OC6, Canada]

A method based on acid digestion, hydride evolution AAS for estimating microgram and submicrogram quantities of As and Se in foods was developed and evaluated. Samples ≤3 g dry wt. were digested with HNO_3-$HClO_4$-H_2SO_4. As and Se in aliquots of the digests were reduced with $NaBH_4$ to volatile hydrides, using laboratory-constructed and commercially available generators. As and Se were eliminated by transient signal atomic absorbance measurements as the hydrides were decomposed in an Ar-H_2-entrained air flame. Recoveries of inorganic As and Se added at levels of 0.1-1.0 μg/g to a variety of foods (including bakery products, vegetables, meat and grain) ranged from 70 to 125%. Recoveries of Se added at 3-12 μg/g from flour, dried skim-milk, steak and swordfish were in the range 84.4-110.3%. Analyses of several standard reference samples indicated the method is capable of recovering native analytes. Detection limits for the determinative step and the method as a whole were as low as 5 and 25 ng, resp. for both elements. AS

2

Determination of total arsenic residues in chicken eggs.

Daghir, N. J.; Hariri, N. N.

Journal of Agricultural and Food Chemistry 25 (5) 1009-1010 (1977) [7 ref. En] [Dep. of Anim. Sci., Fac. of Agric. Sci., American Univ. of Beirut, Beirut, Lebanon]

2 levels (50 and 100 p.p.m.) of 3-nitro-4-hydroxyphenylarsonic acid (3-nitro) were fed to different groups of White Leghorn layers for a period of 15 wk. As residues in eggs laid by these hens were determined all through the experimental period at almost weekly intervals by a spectrophotometric method sensitive to 0.05 p.p.m. Eggs laid by hens receiving 100 p.p.m. 3-nitro in feed contained greater amounts of As at any time point. As residues in eggs laid by both groups increased up to the 4th-5th wk, then decreased. Max. amount found was 0.240 p.p.m. As residues determined 2 wk after the withdrawal of the drug from the feed were negligible. DIH

3

Application of selective evaporation in the determination of arsenic and bromine in dry biological material by thermal neutron activation analysis.

Weers, C. A.; Hoede, D.; Das, H. A.

Journal of Radioanalytical Chemistry 42 (1) 113-119 (1978) [9 ref. En] [Res. Cent., 3 Westerduin Weg Petten (NH), Netherlands]

Samples of animal blood and kale were dissolved and mineralized in H_2SO_4 and H_2O_2. Br was evaporated as Br_2 at 250° C and absorbed in 7M NaOH. After addition of HBr, As was evaporated (as $AsBr_3$) at 90° C and absorbed in 7M NaOH. As and Br are then determined by thermal neutron activation analysis. Results show As contents were 0.05 and 0.12 μg/g DM for animal blood and kale, resp. Br contents were 17.2 and 24.3 μg/g DM for animal blood and kale, resp. using the chemical separation and 17.6 and 26.3 μg/g DM for animal blood and kale, resp., using an instrumental method. Detection limits for the selective evaporation/neutron activation analysis procedure were 5 ng/g for As and 2 ng/g for Br. SP

4

[Determination of total arsenic in biological samples by flameless atomic absorption spectrometry using a carbon tube atomizer.]

Ishizaki, M.

Japan Analyst [Bunseki Kagaku] 26 (10) 667-672 (1977) [11 ref. Ja, en] [Ibaraki Hygienic Lab., Ibaraki, Japan]

As in the ashed sample is separated, by solvent extraction and back extraction, from interfering material; volatilization of As in the tube during ashing is prevented by matrix effect using 0.025% Mg for back extraction and enhancing the As absorbance at atomizing to 2.1 times. The procedure is shown in a flow chart. Tabulated results for apples, spinach, fish, shellfish and liver showed that 0.010-4.15 μg was determined with a mean coeff. of variation of about 11% (5 replicates) and recoveries of 95-102%. [From En summ.] RM

5

A procedure for simultaneous determination of arsenic, cadmium, copper, tin and zinc in beef extract by neutron activation analysis.

Korob, R. O.; Cohen, I. M.; Lage, M.; Mila, M. I.

Journal of Radioanalytical Chemistry 42 (1) 121-132 (1978) [19 ref. En] [Comision Nacional de Energia Atomica, Direccion de Operaciones, Avenida del Libertador 8250, Buenos Aires, Argentina]

Samples of beef extract are irradiated in quartz ampoules for 8 h, and after 48 h decay are washed with HNO_3 and water, dried and cooled with liquid N. Samples are then separated radiochemically using HNO_3 and H_2SO_4. As, Cd, Cu, Sn and Zn carriers are added. Filtrates are washed with HCl for As and Cu detn., and passed in a stream of H_2S for Cd, Cu, Sn and Zn detn. Measurements are carried out with a NaI (Tl) detector. Results show As concn. ranged from 39 to 160 × 10^{-3} p.p.m., Cd concn. from 0.6 to 9.6 × 10^{-3} p.p.m., Cu concn. from 0.51 to 0.91 p.p.m., Sn concn. from 0.7 to 7.9 p.p.m. and Zn concn. from 10.9 to 18.8 p.p.m. SP

6

Ammonium hydrogencarbonate for industrial use (including foodstuffs) - determination of arsenic content - silver diethyldithiocarbamate photometric method.
International Organization for Standardization
International Standard ISO 4275:1977, 2pp. (1977) [En]

The method is applicable to products having As contents of >0.2 mg/kg. It involves reduction of As to arsine by Zn in H_2SO_4 medium, absorption of the arsine in a solution of silver diethyldithiocarbamate in pyridine, and photometric measurement of the purplish-red colour produced at the max. of the absorption curve (approx. 540 nm). AL

7

Determination of arsenic and arsenicals in foods and other biological materials. [Review]
Lewis, R. G.
Residue Reviews 68, 123-149 (1977) [many ref. En] [Health Effects Res. Lab., US Environmental Protection Agency, Res. Triangle Park, N. Carolina 27711, USA]

Methods for detn. of As in foods and other biological materials are reviewed. Aspects covered include the collection and storage of samples, sample preparation (for total As or specific As compounds), standards, and methods of measurement (colorimetry, AAS, radioactivation, other spectroscopic methods, chromatography, electrochemical methods). AAS using non-flame atomization techniques and As electrodeless discharge lamps is recommended for total As detn., specific isolation techniques and GLC for identification and measurement of As compounds. Field desorption MS is specially valuable for identification of specific organo-As compounds, but too expensive for general application. RM

8

Acid digestion, hydride evolution atomic absorption spectrophotometric method for determining arsenic and selenium in foods: collaborative study. I.
Ihnat, M.; Miller, H. J.
Journal of the Association of Official Analytical Chemists 60 (6) 1414-1433 (1977) [23 ref. En] [Agric. Canada, Chem. & Biol. Res. Inst., Ottawa, Ontario K1A OC6, Canada]

The hydride evolution AAS method for determining As and Se in foods developed and evaluated by the FDA and Agriculture Canada laboratories was subjected to collaborative study. 24 laboratories provided results (reported in extenso) for As and 23 provided results for Se levels in 13 different samples consisting of tuna, swordfish, flounder, oyster, liver, flour, dried skim-milk, spinach, kale and apple containing natural levels of As and Se in the ranges 0-15 000 and 0-4000 ng/g, resp. Reference materials formed a substantial segment of samples, and a number of other laboratories using fluorometry, colorimetry, neutron activation, spark source MS, and graphite furnace AAS provided confirmative reference values for the remaining samples. A variety of hydride generation instruments were used, ranging from commercially available devices to semiautomated and fully automated custom-made instruments. Although the accuracy of the method was fairly good, between-laboratory and between-detn. (hydride evolution AAS measurement) precisions were not favourable. The main advantage of the hydride AAS method is the rapidity of the determinative step. AS

9

The arsenic content in some Norwegian fish products.
Egaas, E.; Braekkan, O. R.
Fiskeridirektoratets Skrifter Serie Ernaering 1 (3) 93-98 (1977) [11 ref. En] [Inst. of Vitamin Res., Directorate of Fisheries, Bergen, Norway]

As was determined by AAS in samples of 43 types of fish and other sea-food products [see preceding abstr. for details of products studied]. Tables of data are given showing DM concn., and As concn. expressed on both dry wt. and wet. wt. bases. As concn. (dry wt. basis) ranged from 0.53 mg/kg (whale meat, and cod roe 'caviar') to 58.6 mg/kg (Pandalus borealis shrimp meat). As contents of other products with high As concn. (≥20 mg/kg) included (mg/kg): smoked cod (25.3); smoked Greenland halibut (20.9); cod milt (43.2); crab meat (47.9); and crab paste (54.4). Rat feeding trials with shrimp meat showed practically all the As ingested to be excreted during the next 3 days. AJDW

10

Council Directive of 4 May 1976.
European Economic Community, Council of Ministers
Official Journal of the European Communities 19 (L 126) 31-32 (1976) [5 ref. En]

EEC Directive No. 76/462/EEC of 4 May, 1976, amends for the eleventh time EEC Directive 64/54/EEC on Preservatives in Foodstuffs. The general criteria of purity have been revised as follows: they shall not contain a toxicologically dangerous amount of any element, in particular heavy metals; they shall not contain >3 mg/kg of As or >10 mg/kg of Pb; and they shall not contain >50 mg/kg of Cu and Zn taken together, of which the Zn content must in no case exceed 25 mg/kg. The following substances are added to the list of preservatives which may be authorized for use in foodstuffs in the Annex to Directive 64/54/EEC: sodium derivative of methyl p-hydroxybenzoate (E 219); potassium nitrite (E 249), use solely in a mixture with NaCl; and potassium proprionate (E 283). [See preceding abstr.] VJG

11

[Heavy metals in foods - analytical studies in Austria.] Schwermetalle in der Nahrung - Analytische Kontrolle in Österreich.
Woidich, H.; Pfannhauser, W.
Nahrung 21 (8) 685-695 (1977) [De, en, ru] [Forschungsinst. der Ernährungswirtschaft, Vienna, Austria]

AAS studies on concn. of Pb (1500 samples), Cd (800 samples) and Hg and As (1200 samples) in a wide range of foods, including meat products, fish products, fruit, vegetables, cereal products, dairy products, water, beverages and fats, are described. Tables of mean values and ranges are given. Max. heavy metal concn. recorded were (p.p.m.) Pb 0.990 (sardines); Hg 3.22 (Boletus edulis); As 29.6 (eel); and Cd approx. 1.0 (mussels). On the basis of analytical data and values for food consumption patterns in Austria, per capita monthly intakes of these heavy metals are estimated; estimates for Pb, Hg and As are below the FAO/WHO recommended limit, whereas estimates for Cd are slightly above this limit. AJDW

12

Selenium and arsenic levels in soybeans from different production regions of the United States.
Wauchope, R. D.
Journal of Agricultural and Food Chemistry 26 (1) 226-228 (1978) [12 ref. En] [S. Weed Sci. Lab., USDA, Mississippi Agric. & Forestry Exp. Sta., Stoneville, Mississippi 38776, USA]

Whole soybeans [Glycine max (L.) Merr.] from Arkansas, Florida, Indiana, Iowa, Maryland, Mississippi, and North Carolina were analysed for total As and Se. As levels were $\leq$0.1 p.p.m. (fresh wt.) for all samples and were independent of Se levels. Se levels in soybeans reflected levels in the soil in the region where the soybeans were grown, varying from $\leq$0.07 p.p.m. in low-Se areas (Maryland, Indiana, Florida and North Carolina) to 0.16 p.p.m. (Arkansas), 0.28 p.p.m. (Iowa), and 0.90 p.p.m. (Mississippi). The Se was associated with the oil-free fraction of the soybean. Se levels in the soybeans from Stoneville, in the Mississippi 'Delta' floodplain, were high in comparison with levels in soybeans from other areas considered to have adequate soil Se levels, suggesting that soils in this area may be unusually rich in available Se. Soybeans may be a significant source of Se and possibly other trace nutrients in human and animal diets. AS

13

Ionic interference in the determination of arsenic in water by the silver diethyldithiocarbamate method.
Sandhu, S. S.; Nelson, P.
Analytical Chemistry 50 (2) 322-325 (1978) [16 ref. En] [Claflin Coll., Orangeburg, S. Carolina 29117, USA]

The extent of ionic interference in the use of the standard silver diethyldithiocarbamate (SDDC) method for As detn. in water and waste water is quantitatively evaluated. The absorbance peak at 410 nm is assigned to the formation of a hydrogen-SDDC rather than a chromium-SDDC complex. The SDDC method provides reliable data for As, even in fairly polluted water and its recovery up to 0.5 µg (0.01 mg/l.) from such waters is quantitative. Sb and Hg interfere with As colour development by yielding complexes, with max. absorbance at 510 and 425 nm, resp. Recovery of As, released on digesting standard solutions of natural water as well as cacodylic acid (Na salt), is also quantitative. AS

14

[Contents of heavy metals in brewer's yeast.]
Szmelich, W.
Przemysl Fermentacyjny i Rolny 21 (10) 9-12 (1977) [19 ref. Pl, ru, en, de] [Biskupiec Reszelski, Poland]

Contents of metals in yeasts from 8 breweries were determined. As, Pb and Cu were determined in a yeast slurry which contained 10% DM. Metal concn. in the slurry and on a DM basis resp. were As, 0.06-0.25 and 0.62-2.50 mg/kg; Pb, 0-0.16 and 0-1.55 mg/kg; and Cu, 1.00-3.79 and 10.0-37.9 mg/kg. The mean content of Cu was within the limits permitted by Polish standards for brewer's yeast. The Cu content was high in the brewer's yeast, as Cu vessels are still in use in the boiling house. STI

15

Heavy metals, selenium and arsenic in nine species of Australian commercial fish.
Bebbington, G. N.; Mackay, N. J.; Chvojka, R.; Williams, R. J.; Dunn, A.; Avty, E. H.
Australian Journal of Marine and Freshwater Research 28 (3) 277-286 (1977) [23 ref. En] [NSW State Fisheries, 211 Kent Street, Sydney, NSW 2000, Australia]

Metals levels were determined in samples of muscle tissue from 9 spp. of commercial fish accounting for about 30% of the commercial catch. 20-30 individuals from each species were analysed for Hg, Cd, Pb, Cu and Zn, and 8-12 for Se and As. Of the 232 fish analysed, 231 had Cd, Pb, Cu and Zn concn. below the National Health and Medical Research Council (NHMRC) standards. 16 specimens of bream, snapper (Chrysophris auratus), mulloway (Sciaena antarctica), kingfish, Australian salmon and yellowfin tuna had total Hg concn. >0.5 p.p.m. (NHMRC standard), with max. of 1.94 p.p.m. in snapper. These fish accounted for about 7% of the total sampled. Virtually all the Hg was present as methylmercury. Of the 95 fish analysed for As and Se, 20 (21%) had As concn. > the NHMRC standard of 1.5 p.p.m. As_2O_3 (equivalent to 1.14 p.p.m. As), with max. 4.4 p.p.m. in a snapper. The results suggest that metal contents in fish do not constitute a serious health hazard. RM

16

[Hygienic evaluation of foods from the standpoint of their contamination with harmful metals. I. Pb, Cu, Zn, Sn, As and Fe.]
Nikonorow, M.; Piekacz, H.
Roczniki Panstwowego Zakladu Higieny 29 (2) 121-128 (1978) [available from 1st author Pl, ru, en] [Zaklad Badania Zywnosci i Przedmiotow Uzytku Pandstwowego Zakladu Higieny, Warsaw, Poland]

During 1974 and 1975 the contents of the title metals were determined in vegetable preserves, meat preserves, fish preserves, ice cream, tomato concentrates, tomato juices and various compotes (stewed fruit). Additionally, the contents of Pb and Cu in carbonated beverages during 1969-1975 and of all 6 metals in meat preserves after 1 and 2 yr storage were determined. Results are given in tabular or graph form. With regard to the carbonated beverages, the % of samples with Pb concn. greater than the permitted level ranged from 0.6% in 1975 to 5.0% in 1974; the corresponding range for Cu was from 1% in 1971 to 7.5% in 1974. All the other foods, with the exception of the vegetable preserves, showed for ⩾1 metal concn. above the permitted level. The main sources of contamination with Pb, Cu, Zn and Sn were the metal packaging materials (cans) and the apparatus. HBr

17

Comparative study of the composition of the milk from bovine, caprine, and ovine species.
Mathieu, H.; Jaouen, J.-C. le; Luquet, F. M.; Mouillet, I.
XX International Dairy Congress E, 112-114 (1978) [2 ref. En] [Inst. Tech. de l'Elevage Bovin, Paris, France]

Analyses of French milk during 1973-1975 revealed that ewes' milk was by far the richest in minerals, TS, fat, protein and caseins, with considerable increases during lactation. Goats' milk, the least rich, showed approx. the same compositional changes during lactation as cows' milk. Some milk samples were heavily contaminated with F, As and Cd. [See FSTA (1978) 10 10P1408.] ADL

18

Determination of mercury, arsenic and cadmium in fish by neutron activation.
Anand, S. J. S.
Journal of Radioanalytical Chemistry 44 (1) 101-107 (1978) [35 ref. En] [Air Monitoring Sect., Bhabha Atomic Res. Centre, Trombay, Bombay, India]

Detn. of Hg, As and Cd in fish was carried out by neutron activation followed by chemical separation to remove the interfering activities of Cu, Zn etc. Some common var. of fish from coastal waters of Bombay, and collected from Trombay, Chembur, Sion and Dadar markets, were analysed and results are presented. The ranges and mean contents in the edible tissues of 22 fish samples were (ng/g): Hg, 4.6-282.6 (43.7); As, 68.9-931.2 (543.1); and Cd, 16.1-175.6 (47.3). The average daily intakes of Hg, As and Cd through fish, assuming a daily max. consumption of 6 g/person, are estimated at 262 ng, 3.2 μg and 284 ng, resp., which are below the tolerable daily intake values. A table compares the levels of Hg, As and Cd in fish analysed by various workers in different countries. AL

19

Contaminating elements in mineral supplements and their potential toxicity: a review.
Ammerman, C. B.; Miller, S. M.; Fick, K. R.; Hansard, S. L., II
Journal of Animal Science 44 (3) 485-508 (1977) [249 ref. En] [Dep. of Anim. Sci., Univ. of Florida, Gainesville, Florida 32611, USA]

Information to help evaluate the potential injury to animals which may ingest Pb, Cd, Hg, As and V is presented, together with an estimation of the potential risk to consumers of edible animal products. AL

20

[Processed foods. Determination of metallic contaminants. Determination of arsenic content.]
Hungary, Magyar Szabvanyugyi Hivatal
Hungarian Standard MSZ 3612/5-76, 6pp. (1976) [Hu]

21

A routine screening method for toxic metals in foods.
Allenby, P.; Robertson, J. W.; Shenton, F. C.
Journal of the Association of Public Analysts 15 (2) 61-68 (1977) [17 ref. En] [N.E. Regional Analysts Dep., County Hall, Durham, UK]

A method for the estimation of Pb, Cu, Cd, Zn and As in foods in high and low concn. is described. The sample is partially digested with sulphuric acid and then dry ashed. The ash is dissolved in 3N hydrochloric acid and high levels of Pb, Cu, Cd and Zn are measured in this solution by flame AAS. As is measured in the acid solution by the Gutzeit method. When low levels of Pb, Cu, Cd or Zn are found, the acid solution is extracted with diethylammonium diethyldithio-carbamate in heptan-3-one before aspiration into the instrument. The effects of acidity, shaking time and standing on this extraction system have been investigated. High concn. of Ca and Fe have no important effect on the extraction procedure. A wide variety of foods has been analysed successfully. The s.d. is low. In a 20 g sample, 0.1 p.p.m. Pb, 0.1 p.p.m. Cu, 0.02 p.p.m. Cd and 0.05 p.p.m. Zn can be confidently determined. AS

22

[Substitution of arsenic oxide by phosphate when plotting the calibration curve for arsenic determination in canned products.]

Mikhailova, N. V.; Litvinova, V. D.; Radomskaya, L. G.

Konservnaya i Ovoshchesushil'naya Promyshlennost' No. 9, 38-39 (1977) [2 ref. Ru] [Ukrainskii Nauchno-issled. Inst. Konservnoi Promyshlennosti, USSR]

An extraction photometric micromethod was elaborated for the detn. of As in vegetables and canned products at the Ukrainian Research Institute of the Canning Industry [Konservnaya Ovoshchesushil'naya Promyshlennost' (1975) No. 10, 36]. Arsenic oxide was necessary for plotting the calibration curve. It was established that P as well as As formed a blue complex with Mo, absorbing colour almost in equal wave-lengths, i.e. 830-840 nm. Colour intensity of the P-Mo complex at the concn. of 1.5 μg PO_4 ions in 1 ml corresponds to colour intensity of AsMo blue at the concn. of 2 μg As in 1 ml of the solution. On this basis appropriate calibration curves were plotted using potassium phosphate and As. The procedure used is described. Tests with a known amount of As added to canned vegetables showed the method to be very accurate. STI

23

Arsenic residues in soybean seed from simulated MSMA spray drift.

Wauchope, R. D.; McWhorter, C. G.

Bulletin of Environmental Contamination and Toxicology 17 (2) 165-167 (1977) [9 ref. En] [USDA, Agric. Res. Service, S. Weed Sci. Lab., Stoneville, Mississippi 38776, USA]

Soybeans were sprayed with sodium methanearsonate (MSMA) to simulate spray drift from treatment of other crops. Mechanically harvested seeds were analysed for As residues by flameless AAS. Washings from seeds showed no As, indicating that residues existed within the seeds. Significant As residues (above background levels) of >0.9 p.p.m. were found in mature soybean seeds even for the lowest application rate (0.11 kg/ha) when exposed late in the season. Early exposure did not cause As contamination of the seeds. JRR

24

Mineral concentrations in animal tissues: certain aspects of FDA's regulatory role.

Mahaffey, K. R.

Journal of Animal Science 44 (3) 509-515 (1977) [19 ref. En] [Div. of Nutr., Bureau of Foods, FDA, Washington, DC 20204, USA]

Current FDA regulatory programmes in toxic metals (Hg, Pb, Cd, Zn, As and Se) and detn. of max. tolerable levels in foods are discussed, as well as the regulation of metals intended as nutritional or veterinary feed supplements for animals in relation to the resultant metal content of edible animal tissues and products. AL

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H. BROOKES

EDITOR

1

Arsenite and arsenate levels in wine.
Crecelius, E. A.
Bulletin of Environmental Contamination and Toxicology 18 (2) 227–230 (1977) [7 ref. En] [Marine Res. Lab., Batelle Pacific N.W. Div., Route 5, Box 1000, Sequim, Washington 98382, USA]

19 samples of domestic table wines from the USA were analysed for several spp. of As. Half the samples greatly exceeded the max. allowable drinking water standard of 50 parts/10^9 and most of the As was present in the highly toxic AS^{3+} form. Highest total As concn. found was 530 parts/10^9. Arsenic spp. were added to a wine juice and fermented with Montrachet yeast; after 2 wk fermentation had ceased and 60% of the AS^{3+} had been reduced to the more toxic As^{3+} form. JRR

2

Determination of arsenic and tin in canned food by flameless atomic absorption spectrophotometry. [Lecture]
Hu, C. T.
International Congress of Food Science & Technology - Abstracts p.253 (1978) [En] [Sci. Res. Inst. of Food & Fermentation Ind., Min. of Light Ind., Peking, China]

For As detn., samples are digested by HNO_3-H_2SO_4, the As^{5+} is reduced to As^{3+}, then As^{3+} is reacted with KBH_4 solution; the gaseous mixture produced is atomized in an electrically heated quartz tube and the atomic absorption of As is measured at 193.7 nm. For Sn detn., samples are digested by H_2SO_4.H_2O_2, the pH is adjusted to 0.60–0.84, then Sn is reacted with KBH_4 solution; the gaseous mixture produced is atomized in an electrically heated quartz tube and the atomic absorption of Sn is measured at 286.3 nm. Detection limits of the method are 0.001 and 0.0025 μg/ml for As and Sn, resp. Recoveries from fortified samples were 96% (relative s.d. 7.2%) for As and 99.7% (relative s.d. 6.8%) for Sn. [See FSTA (1979) 11 2A60.] JA

3

[Determination of parts per billion level arsenic in well water.]
Kaneko, E.
Japan Analyst [Bunseki Kagaku] 27 (4) 250–252 (1978) [12 ref. Ja, en] [Sendai Municipal Inst. of Public Health, Sendai, Japan]

Coprecipitation of As with $Fe(OH)_3$ was used to determine the concn. of As at the parts/billion (p.p.b.) level in well water. Both As(III) and As(V) were completely coprecipitated at pH 3.5–10.0. The precipitate is dissolved in 4N HCl and As determined by AAS. Average recovery of As(III) and As(V) was 98%, with coeff. of variation 5.5 and 4.9% resp. Concn. of > 1.0 p.p.b. As in well water can be determined by either AAS or the Gutzeit method after coprecipitation. [From En summ.] RM

4

[Simplified digestion method and determination of lead, cadmium and arsenic in animal tissues by atomic absorption spectrometry.] Vereinfachte Aufschlussmethode und Messtechnik zur Bestimmung von Blei, Cadmium und Arsen in tierischen Geweben mittels Atomabsorptionsspektrometrie.
Holm, J.
Fleischwirtschaft 58 (5) 864–866; 745 (1978) [17 ref. De, en] [Staatliches Veterinäruntersuchungsamt, Dresdenstrasse 6, 3300 Braunschweig, Federal Republic of Germany]

The previously developed method [FSTA (1976) 8 11S1897] is described with a view to its use for quick and accurate residue detn. for official meat examination. Pb, Cd and As concn. were determined in muscle, liver and kidney by wet digestion and AAS, and the method critically examined. Limits of detection for the 3 metals were 0.5–1.0 parts/billion; recovery rates were 87–107% for Pb (0.25–2.0 ng additions) in all tissues, 84–106% for Cd (0.05–0.4 ng) in all tissues, 82–92% for As (12.5–100.0 ng) in muscle and liver, and 75% for As in kidney. The low As recovery in kidney could be due to a matrix effect of the As-hydride system. Reproducibility was satisfactory. Optimum loading of the instrument and the quick digestion method allowed results to be obtained within 24 h. A disadvantage of the method is that it does not include Hg detn. RM

5

Enzyme-catalyzed reaction-rate method for determination of arsenic in water.
Goode, S. R.; Matthews, R. J.
Analytical Chemistry 50 (12) 1608–1610 (1978) [27 ref. En] [Dep. of Chem., Univ. of S. Carolina, Columbia, S. Carolina 29208, USA]

A new unique enzymic method for the detn. of As is discussed. The enzyme glyceraldehyde-3-phosphate dehydrogenase is used to perform an oxidative arsenolysis of D-glyceraldehyde-3-phosphate. The rate of reaction, as measured by fluorescence, is first order in arsenic (V). The method has a linear calibration plot for the range 0.02–2.0 μg/ml As. Samples of public drinking water and river water were analysed by the enzymic technique. The near-quantitative recovery of spiked samples indicates that these matrices do not contain sufficient quantities of interferents to require any sample preconcentration or chemical treatment prior to analysis. AS

6

Accumulation of arsenic, lead and other heavy elements in the iron-manganese oxide-hydroxide precipitation in the pipelines of city waterworks.
Bacso, J.; Szalay, A.; Kiss, K.
Science of the Total Environment 9 (3) 271–276 (1978) [3 ref. En] [Inst. of Nuclear Res. of the Hungarian Acad. of Sci., Debrecen, Hungary]

Iron-manganese oxide-hydroxide precipitates in the pipelines of waterworks of several Hungarian cities were analysed, and the accumulation of significant amounts of As, Pb, Cu and Zn was observed. The investigations demonstrated that the concn. of these trace elements in water is very small, but the high colloidal surface of the iron-manganese oxide-hydroxide precipitate lining pipes is highly enriched in these elements. Assay of these precipitates provides a very sensitive technique for monitoring water contamination. AS

7

[Arsenic residues in meat and organ samples from domestic slaughter animals, water fowl and game.] Arsenrückstände in Fleisch- und Organproben von schlachtbaren Haustieren, Wassergeflügel und Niederwild.
Holm, J.
Fleischwirtschaft 58 (9) 1545–1546; 1446 (1978) [11 ref. De, en] [Staatliches Veterinäruntersuchungsamt, Dresdenstrasse 6, 3300 Braunschweig, Federal Republic of Germany]

As residues were determined in meat, liver and kidney samples from 65 pigs, 40 bulls and steers, 35 calves, 50 cows, 30 horses, 269 geese, 27 ducks, 29 deer, and 11 hares from Lower Saxony. Samples were analysed by wet digestion and AAS. Tabulated data showed mean As concn. (p.p.m.) of ≤ 0.01 fresh wt. (max. 0.030) in meat (except for 0.024 in hares), ≤ 0.017 (max. 0.051) in liver, and ≤ 0.034 (max. 0.087) in kidneys. In contrast, beef from potential As-immission areas contained mean 0.063 (max. 0.160) in meat, 0.067 (0.140) in liver and 0.132 (0.221) in kidneys. RM

8

[Standards (1976) for levels of arsenic, lead, cadmium and mercury in foods.] Richtwerte '76 über Arsen-, Blei-, Cadmium- und Quecksilbergehalte in Lebensmitteln.
Anon.
Bundesgesundheitsblatt 20 (5) 76 (1977) [De]

A table is given of standard max. levels of heavy metals in several foods, expressed as mg/kg fresh wt. Food groups covered include beef, pork and poultry meats, milk and milk products, vegetables, fruit, cereals, sugar, beer and vegetable oils. JRR

9

Atomic absorption spectrometric determination of arsenic and selenium in offal and fish by hydride generation.
Flanjak, J.
Journal of the Association of Official Analytical Chemists 61 (5) 1299–1303 (1978) [22 ref. En] [Health Commission of New South Wales, Div. of Analytical Lab., PO Box 162, Lidcombe, NSW 2141, Australia]

A method for determining As and Se in beef offal and fish was developed. The sample was digested by heating with a mixture of HNO_3, $HClO_4$ and H_2SO_4. No prereduction of As and Se was necessary. Using a simplified generator, the metal hydrides were evolved by reduction with $NaBH_4$ pellets from H_2SO_4 and HCl media. The hydrides were swept by a flow of N_2 into an N_2/H_2-entrained air flame. Absolute detection limit of the method was about 6 ng for As and 4 ng for Se, and absolute sensitivity for both metals was estimated to be 5 ng. Effects of the presence of several cations and anions in the matrix were investigated and some were found to have a suppressive effect on the atomic absorption signal. The analytical results obtained for samples of NBS No. 1571 Orchard Leaves and NBS No. 1577 Bovine Liver agreed well with certified values. AS

10

[Natural and other toxic materials in food.]
Ammon, R.
Elelmezesi Ipar 32 (9) 328–335 (1978) [Hu, en, de, ru] [Univ. des Saarlandes Physiol.-Chem. Inst., 6650 Homburg, Federal Republic of Germany]

Aspects considered in this discussion of toxic materials in food include: pollen-derived toxic materials in honey; poisonous fungi; cyanides; tetrodotoxin in fugu fish; dinoflagellate toxins in shellfish; Clostridium botulinum toxin; staphylococcal toxin; mycotoxins; monoamine oxidase inhibitors and their interaction with dietary amines; allergens; F; As; Pb; Hg; Cd; DDT; and biphenyl. AJDW

11

Mercury, arsenic and cadmium in the unfried and fried fish.
Anand, S. J. S.
Journal of Radioanalytical Chemistry 47 (1/2) 93–97 (1978) [7 ref. En] [Air Monitoring Sect., Bhabha Atomic Res. Cent., Trombay, Bombay-400 085, India]

Detn. of Hg, As and Cd in unfried and fried samples of fish, Pampus argentius (pomfret), was carried out by neutron activation followed by chemical separation to remove the interfering activities of Cu, Zn etc. Losses of Hg on frying (for 4–7 min) ranged from 11.4% to 43.7% in 8 samples of fish; data are tabulated. Thus frying can reduce the Hg burden of fish to a limited extent, but As and Cd burdens remained unaffected. AL

12

Determination of germanium, arsenic, tin, selenium, and antimony by plasma emission spectrometry with hydride generation and chromatographic separation.
Fricke, F. L.; Robbins, W. D.; Caruso, J. A.
Journal of the Association of Official Analytical Chemists 61 (5) 1118–1123 (1978) [21 ref. En] [Dep. of Chem., Univ. of Cincinnati, Cincinnati, Ohio 45221, USA]

A semiautomated hydride generation device was coupled to a microwave-induced Ar/He plasma which is used with a 0.5 m monochromator. This coupling necessitated the use of a condensation tube and a Chromosorb 102 column to separate the analyte spp. from H_2 produced during the generation reaction, and also to separate the analytes from condensed contaminants which cause spectral background interference. Data reported for Ge, As, Se, Sn, and Sb are detection limits in the parts/billion range and linear dynamic ranges which extend to 3 orders of magnitude. Precision of results ranges from 2.9 to 8.8%. Chromatographic characteristics of the elemental hydrides on 1, 3, and 6 ft columns are also reported. This system or portions of it can be used to substantially decrease both time and quantities of reagents needed for analysis in both simultaneous and sequential experiments in either emission spectroscopy or AAS. Hydrides may be generated from a wide range of matrices including foods; but complex samples have not yet been studied. AS

13

Evaluation of a method for determination of total antimony, arsenic and tin in foodstuffs using measurement by atomic-absorption spectrophotometry with atomisation in a silica tube using the hydride generation technique.
Evans, W. H.; Jackson, F. J.; Dellar, D.
Analyst 104 (1234) 16-34 (1979) [29 ref. En] [Dep. of Ind., Lab. of Gov. Chemist, Cornwall House, Stamford Street, London SE1 9NQ, UK]

A method is described for the detn. of Sb, As and Sn in food in which organic matter is destroyed using a wet-oxidation procedure, except for As in samples of marine origin in which organic matter is destroyed by the dry-ashing technique. Each element is obtained in the highest valency state and converted into the respective normal hydride with sodium tetrahydroborate (III), prior to atomization in a flame-heated silica tube and AAS measurement. Optimum conditions for this procedure are discussed and direct and indirect interference effects are described. The accuracy of the procedure is assessed for each element, and where possible the accuracy of the method in application is considered. Standard deviations of the results for levels normally found in foods (dried milk, flour, apricot puree, tuna, kidney, spinach and standard materials) have been calculated and derived limits of detection and confidence intervals are given. AS

14

[Surveillance of contamination of the food chain in France.]
Pomarola, H.
Medecine et Nutrition 12 (3) 169-178 (1976) [Fr, en] [Lab. du Min. de l'Agric., 25 Avenue de la Republique, 91305 Massy, France]

Surveillance of the food chain for contamination with radioelements, pathogenic microorganisms, parasites, pesticides and heavy metals in France is discussed, with reference to the legal situation, and activities of the Ministry of Agriculture. Control of use of food additives is also considered. AJDW

15

Selective determination of inorganic arsenic(III), (V) and organic arsenic in biological materials by solvent extraction-atomic absorption spectrophotometry.
Yasui, A.; Tsutsumi, C.; Toda, S.
Agricultural and Biological Chemistry 42 (11) 2139-2145 (1978) [12 ref. En] [Nat. Food Res. Inst., Min. of Agric., Forestry & Fishery, 1-4-12 Shiohama, Koto-ku, Tokyo 135, Japan]

A new method for the selective detn. of inorganic As(III) and As(V), and organic As is described. Each chemical form of As in biological materials was solubilized in 6N HCl. Inorganic As(III) was extracted into toluene from 9N HCl solution, and inorganic As(V) was also extracted after reduction by KI. Organic As was retained in HCl solution. After As in toluene solution was back-extracted into water, aqueous or HCl solution containing As was wet digested with a mixture of HNO_3, H_2SO_4 and $HClO_4$, and As was determined by AAS. The proposed method was applied to some kinds of algae, shark muscle and orchard leaves (NBS SRM 1571). 90-100% of As in algae (Wakame, Arame, Kazime) and shark muscle was organic, while all the As in orchard leaves was inorganic. AS

16

Mercury, arsenic, lead, cadmium, and selenium residues in fish, 1971-73 - National Pesticide Monitoring Program.
Walsh, D. F.; Berger, B. L.; Bean, J. R.
Pesticides Monitoring Journal 11 (1) 5-34 (1977) [14 ref. En] [Fish & Wildlife Service, U.S. Dep. of Interior, 17 Executive Park Drive, N.E. Atlanta, Georgia 30329, USA]

As part of the National Pesticide Monitoring Program, the Fish and Wildlife Service analysed numerous selected fish samples (from river systems, coastal streams, Hudson Bay drainage, Great Lakes drainage, and interior basins) from 100 monitoring stations throughout the USA for residues of Hg, As, Pb, Cd and Se in 1971-1973. At most stations, detectable residues of all metals were present in > 95% of the composite samples. Fish with Hg residues > 0.5 mg/kg wet wt. in the whole fish were mainly predators. Fish with residues of As, Pb, Cd and Se of > 0.5 mg/kg included predatory and non-pre datory spp. Detailed results showing location, fish spp., size, number of fish and residues levels are given in tables for the 3 separate yr; only selected samples were analysed in 1973. Residues in the river fish analysed are based on wet wt. of the whole fish; the concn. in edible portions would probably be lower. AL

17

Mercury, cadmium, lead, and arsenic in sediments, plankton, and clams from Lake Washington and Sardis Reservoir, Mississippi, October 1975-May 1976.
Price, R. E.; Knight, L. A., Jr.
Pesticides Monitoring Journal 11 (4) 182-189 (1978) [26 ref. En] [Dep. of Biol., Univ. of Mississippi, University, Mississippi 38655, USA]

Mean concn. of Hg, Cd, Pb and As were highest in plankton, and levels were only slightly higher in clams than in sediments. Comparisons between clam size and trace metal concn. showed higher levels of Hg in the smaller clams. AL

18

Condensed phosphates for industrial use (including foodstuffs). Determination of arsenic content. Silver diethyldithiocarbamate photometric method.
International Organization for Standardization
International Standard ISO 5372:1978, 2pp. (1978) [En]

The method is applicable to products having As contents ≥0.2 mg/kg. It involves dissolution of a test portion, acidification with HCl solution and oxidation with potassium bromide-bromate solution, followed by hydrolysis, and detn. of As. AL

19

[Heavy metals in the legislation of EEC countries - public health problems.]
Billani, L.
Atti della Societa Italiana delle Scienze Veterinarie

20

[Problem of contamination of food of animal origin with arsenic.] [Review]
Maggi, E.
Atti della Societa Italiana delle Scienze Veterinarie 30, 101–115 (1976) [59 ref. It] [Univ. di Parma, Parma, Italy]

Aspects discussed include: As and its compounds; the diffusion of As in the environment; toxicity and pharmacological action of As; veterinary and agricultural uses of As; residues of As in meat, fish, milk and eggs; and estimation of As. Of 385 samples of beef from 10 urban areas of N. Italy, 61 contained >0.01 p.p.m. As, including 1 with >0.1 p.p.m. JMD

21

[Physico-chemical analysis of drinking water. Determination of arsenic.]
Czechoslovakia, Urad pro Normalizaci a Mereni
Czechoslovak Standard CSN 83 0520, Part 41, 4pp. (1977) [Cs]

This standard stipulates conditions for detn. of As at concn. >0.05 mg/l. by photometry. [See preceding abstr. for part 40.] HBr

22

A simple procedure for the determination of arsenic and tin in food by atomic absorption spectrophotometry.
Rees, D. I.
Journal of the Association of Public Analysts 16 (3) 71–75 (1978) [7 ref. En] [Lyons Cent. Lab., 149 Hammersmith Road, London W14 OQU, UK]

A hydride generation technique, which merely utilises a boiling tube and a large-bore tap, is presented as a reliable and simple method for the detn. of levels of As and Sn in foods down to 0.1 p.p.m. AS

23

[Chemical residues in milk. Development of contamination.]
Mouillet, L.; Luquet, E. M.; Mahieu, H.
Alimentation et la Vie 66 (2) 108–118 (1978) [8 ref. Fr] [Labcodral, 105 Rue de Universite, 59509 Douai, France]

The organochlorine pesticide and metal contamination of milk in France was studied between 1970 and 1976. Results, shown graphically and in tables, suggest progressive reduction in organochlorine residues, with fairly low levels from 1974 onwards. Heptachlor residues are falling from the excessive levels of the early 1970s to <100 μg/kg, dieldrin and lindane are tending to stabilize at 50 and 100 μg/kg, resp., and (α + β)-BHC is generally <100 μg/kg fat. Appreciable rises in Cu and Fe concn. takes place during processing of milk. Other metals (Mn, As, Cd, Hg, Pb) and F are present at low levels. RM

24

Proceedings of the International Conference on Environmental Arsenic. Fort Lauderdale, Florida, October 5–8, 1976. [Conference proceedings]
Fowler, B. A. **(United States of America,** National Institute of Environmental Health Sciences; **Sweden,** Department of Environmental Hygiene, Karolinska Institute; Permanent Commission and International Association on Occupational Health) (Chairman)
Environmental Health Perspectives 19, 1–242 (1977) [many ref. En] [Box 12233, Research Triangle Park, N. Carolina 27709, USA]

The full texts of papers from this conference, convened to assess the level of knowledge about As as an environmental toxicant, are given. Successive sessions were devoted to: Methods and problems of analysis; Sources of environmental pollution; Occurrence and transformation in nature; Effects and dose-response relationships in humans; Kinetics and metabolism; and Effects and dose-response relationships in animals. Three papers from the conference are abstracted separately, and appear in the FSTA author index under **United States of America,** National Institute of Environmental Health Sciences [Arsenic Symposium]. JRR

25

Levels of arsenic in the United States food supply. [Lecture]
Jelinek, C. F.; Corneliussen, P. E.
Environmental Health Perspectives 19, 83–87 (1977) [1 ref. En] [Bureau of Foods, FDA, 200 C Street, SW, Washington, DC 20204, USA]

At the present time, the FDA accords the highest priority to Hg, Pb, Cd, As, Se, and Zn in its programme on toxic elements in foods. The only regulatory levels for As in foods in the USA are tolerances established for its residues in specified foods, resulting from the application of arsenical pesticides on food and feed crops and from animal feed additives. FDA has monitored for As in its Total Diet Survey since the inception of this programme. Data from this programme indicate that average daily intake for As (as As_2O_3) has decreased from about 130 μg/day in 1968 to about 20 μg/day in 1974. Most of the As is found in the meat-fish-poultry food class of the total diet. In individual foods, highest levels were found in fish, with a mean level of about 1.5 p.p.m. (as As_2O_3) in the edible portion of finfish. Much lower levels were found in all the other food types analysed; of these, highest levels found were a mean of 0.08 p.p.m. in chicken and 0.16 p.p.m. in rice. FDA toxicologists do not believe that the average daily intake of As, or its levels in the different food commodities, pose a hazard to the consumer. [See FSTA (1979) 11 10C578.] AS

26

Arsenic in the drinking water of the city of Antofagasta: epidemiological and clinical study before and after the installation of a treatment plant. [Lecture]
Borgono, J. M.; Vicent, P.; Venturino, H.; Infante, A.
Environmental Health Perspectives 19, 103–105 (1977) [En] [Servicio Nacional de Salud, Min. de Salud Publica, Santiago, Chile]

This is a 2nd report of an epidemiological and clinical investigation, related to the As health problem, unique

in the world, occurring in Antofagasta, Chile. The As problem originates in the chronic contamination of water supply in the city over 12 yr. This phenomenon, investigated clinically and epidemiologically and first reported in 1971, prompted installation of a water treatment plant. This report aims to evaluate the working efficiency of the plant. The study was carried out through the examination of As content in the hair and nail clipping samples of inhabitants of Antofagasta and detn. of this element in cultivated vegetables and carbonated beverages. Also a clinical study in school children, looking for cutaneous lesions attributed to arsenicism, was made. Results are encouraging. They reveal that contamination persists but in significantly lower levels. [See FSTA (1979) 11 10C578]. AS

27

Arsenic levels in Oregon waters. [Lecture]
Whanger, P. D.; Weswig, P. H.; Stoner, J. C.
Environmental Health Perspectives 19, 139–143 (1977) [12 ref. En] [Dep. of Agric. Chem., Oregon State Univ., Corvallis, Oregon 97331, USA]

The As content of well water in certain areas of Oregon can range up to 30–40 × the USPHS Drinking Water Standard of 1962, where concn. > 50 parts per 10^9 are grounds for rejection. Elevated As levels in water are postulated to be due to volcanic deposits. Wells in central Lane County, Oregon, known to contain As-rich water, are in an area underlain by a particular group of sedimentary and volcanic rocks (the Fischer formation). As levels in water from wells ranged from no detectable amounts to 2000 parts per 10^9. In general, deeper wells contained higher As water. High-As waters are characterized by small amounts of Ca and Mg in relation to that of Na, high content of B, and high pH. Water from some hot springs in other areas of Oregon was found to reach as high as 900 parts per 10^9 As. As blood levels ranged from 32 parts per 10^9 for people living in areas where water is low in As to 250 parts per 10^9 for those living in areas where water is known to contain high levels of As. Some health problems associated with consumption of As-rich water are discussed. [See FSTA (1979) 11 10C578.] AS

28

Radiochemical activation analysis of arsenic, selenium and antimony in biological samples.
Rosenberg, R. J.
Journal of Radioanalytical Chemistry 50 (1/2) 109–114 (1979) [17 ref. En] [Tech. Res. Cent. of Finland, Reactor Lab., SF-02150 Espoo 15, Finland]

A method for neutron activation analysis of As, Se and Sb has been developed. Radiochemical separation is performed by distillation followed by precipitation of individual elements. Se and As are precipitated by reduction to the elemental form while Sb is precipitated as sulphide. Chemical yields and detection limits using 0.5 g samples were: As 90–100%, 0.4 parts/billion (p.p.b.); Se 80–100%, 8 p.p.b.; and Sb 50–70%, 0.2 p.p.b. Results from analysis of 9 international biological standard samples (including bovine liver, wheat flour, dried potatoes, and fish flesh) are given. The method is accurate, sensitive and suitable for analysis of low concn., but the procedure is labour-intensive and a simpler method is recommended when analysing concn. in the p.p.m. region. AL

29

[Residue problems caused by heavy metals and arsenic in feed and food.] Rückstandsprobleme durch Schwermetalle und Arsen in Futter- und Lebensmitteln.
Kühnert, M.; Fuchs, V.; Polo, C. A.
Monatshefte für Veterinärmedizin 34 (6) 206–212 (1979) [28 ref. De, en ru] [Sektion Tierproduktion & Vetmed., Karl-Marx-Univ. Leipzig. German Democratic Republic]

Problems with residues of Pb, Cd, Hg and As in foods are discussed, with reference to their toxicity, distribution within the body, accumulation in tissues, major sources of contamination, and possible interaction with other contaminants. Major sources of contamination of foods and feeds include industrial effluents and motor vehicle exhaust gases. Establishment of tolerances for heavy metals in foods is also considered. IN

30

[A rapid decomposition process for large samples of biological materials and its use in the determination of trace amounts of heavy metals.] Schnellverfahren für den Aufschluss von grösseren Mengen an Biomaterial zur analytischen Erfassung von Schwermetallspuren.
Scheubeck, E.; Nielsen, A.; Iwantscheff, G.
Zeitschrift für Analytische Chemie 294 (5) 398–401 (1979) [12 ref. De, en] [Siemens AG, Postfach 3240, D-8520 Erlangen, Federal Republic of Germany]

20 g samples of biological material with 70–80% moisture content were pre-dried in a closed pressure vessel and then burnt in O_2. All traces of heavy metals appear quantitatively in a solution consisting of the condensates from drying and combustion products of the organic matrix. Decomposition takes < 30 min. Hg, Cd, Pb and As at concn. of 50–250 parts/billion or in amounts of 1–5 μg were detected in beef or pork meat, liver and kidney with recoveries of 80–90%. AS

31

Trace metal content of livers and kidneys of cattle.
Flanjak, J.; Lee, H. Y.
Journal of the Science of Food and Agriculture 30 (5) 503–507 (1979) [17 ref. En] [Div. of Analytical Lab., Health Commission of NSW, PO Box 162 Lidcombe, 2141 NSW, Australia]

Results are presented for levels of trace metals as determined by AAS, in livers and kidneys of 190 cattle from 8 different locations in New South Wales. Mean and range for each of the trace metals, in p.p.m., in livers and kidneys, resp. were as follows (nd = not detected): As 0.013 (nd-0.09) and 0.018 (nd-0.10); Cd 0.08 (nd-0.80) and 0.43 (0.02-10.7); Cr 0.05 (nd-1.0) and 0.03 (nd-0.22); Co 0.07 (nd-0.45) and 0.03 (nd-0.25); Cu 18.0 (0.81-82.8) and 3.9 (1.84-9.2); Pb 0.14 (nd-0.85) and 0.22 (nd-2.29); Mn 2.72 (1.11-4.09) and 1.07 (0.58-1.67); Hg 0.005 (nd-0.050) and 0.006 (nd-0.177); Mo 0.88 (nd-2.41) and 0.31 (nd-1.85); Ni 0.33 (nd-4.82) and 0.46 (nd-5.80); Se 0.17

(0.01-0.63) and 1.10 (0.47-1.77); and Zn 37.5 (13.4-99.2) and 18.6 (12.9-31.6). Significant differences were observed in the trace metal levels in livers and kidneys from the different regions of the State and between the trace metal levels in livers and kidneys from the same region. Accuracy of the methods was confirmed by analysis of NBS No. 1577 Bovine Liver. AS

32

Comparative studies on trace metal levels in marine biota. II. Trace metals in krill, krill products and fish from the Antarctic Scotia Sea.

Stoeppler, M.; Brandt, K.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung **169** (2) 95–98 (1979) [40 ref. En, de] [Inst. of Chem., Nuclear Res. Cent., D-5170 Jülich, Federal Republic of Germany]

In whole krill, krill muscle tissue, krill products and in fillets of the antarctic fish Notothenia rossi marmorata, Dissostichus eleginoides, and Notothenia gibberifrons the levels of Cd, Pb, Cu, Ni, Hg and As were determined. Methods applied were electrothermal AAS for Cd, Pb, Cu, and Ni, cold-vapour and hydride-generation AAS for Hg and AS, resp., usually after HNO_3 pressure decomposition and for As followed by $HClO_4/H_2SO_4$ treatment. Quality control was performed by analysis of appropriate standard reference materials and working standards and by intercomparison with differential pulse anodic-stripping voltammetry (DPASV) for Pb and Cd. Mean values obtained related to fresh wt. for krill muscle meat (46 ng Cd/g, $\leq$50 ng Pb/g, 380 ng Cu/g, 130 ng Ni/g, $\leq$20 ng Hg/g, and 340 ng As/g) and fillets of Antarctic fish ($\leq$3 ng Cd/g, $\leq$100 ng Pb/g, $\leq$200 ng Cu/g, $\leq$150 ng Ni/g, $\leq$50 ng Hg/g, and 300–1500 ng As/g) confirm the absence of toxic risks for human food according to present knowledge. Due to the somewhat higher, but not excessive, trace metal contents of krill products, these should be more suitable as a protein rich animal feed. AS

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FAB 40

ARSENIC IN FOODS

SELECTED FROM VOLUME 12
FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

under the direction of

Commonwealth Agricultural Bureaux, Farnham Royal, Bucks; Gesellschaft fur Information und Dokumentation, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen.

INTRODUCTION

Food Annotated Bibliographies (FABs) are collections of abstracts on specific topics in food science and technology. The topics are chosen by the staff of the International Food Information Service as being of particular interest or importance. The topics normally interest individual workers, who may not require the full information provided in Food Science and Technology Abstracts, from which the abstracts for FABs are taken. The size and the cost of the FABs are controlled as much as possible with the interests of individual workers in mind.

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Some of the larger FABs have been divided into sections to facilitate use. FAB 47 also has a subject and author index provided.

Copies of all original articles referred to in the abstracts may be bought (or occasionally borrowed) from the International Food Information Service. A form for ordering these is provided at the end of this FAB.

Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would, in any case, encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES

EDITOR

1

[Contents of arsenic, copper and manganese in some species of macrofungi.]
Lasota, W.; Florczak, J.
Bromatologia i Chemia Toksykologiczna 12 (1) 94–95 (1979) [4 ref. Pl] [Zaklad Bromatologii Inst. Badania Srodowiska i Bioanalizy Akad. Med., Lodz, Poland]

As, Cu and Mn contents of 13 var. of macrofungi were determined. Concn. ranges found (mg/kg DM) were: As, 0.091 (Xerocomus badius)–0.76 (Tricholoma flavovirens); Cu, 14.2 (Suillus luteus)–71.9 (Paxillus involutus); and Mn, 22.2 (Sarcodon imbricatum)–112.4 (Catathelasma imperiale). HBr

2

[Arsenic, selenium, fluorine and iodine in seaweeds.]
Adachi, S.
Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] 19 (5) 491–495 (1978) [13 ref. Ja] [Kagawa Nutr. Coll., Komagome 3-chome, Toshima-ku, Tokyo, Japan]

The contents of As, Se, F and I in 11 var. of edible seaweeds were analysed. 50% of the As and 30% of the Se were soluble in redistilled water, while the F and I were almost insoluble in water. TM

3

Heavy metal residues in dulse, an edible seaweed.
Sirota, G. R.; Uthe, J. F.
Aquaculture 18 (1) 41–44 (1979) [4 ref. En] [Tech. Branch, Halifax Lab., Fisheries & Oceans Canada, PO Box 550, Halifax, Nova Scotia, B3J 2S7, Canada]

Dulse (*Palmaria palmata* Guiry, formerly *Rhodymenia palmata)* is dried and consumed as a relatively common snack food on the east coast of N. America. Duplicate samples of dulse harvested from 3 geographically different areas (Dark Harbour and Front Island on Grand Manan Island, and Maces Bay on the mainland of New Brunswick) and a common holding tank were analysed for As, Cu, Cd, Pb, Se, Zn and Hg by flameless AAS. Concn. ranges (μg/g dry wt) were: As 5.50–7.50, Cu 3.90–6.34, Cd 0.97–2.65, Pb 0.688–3.50, Se 2.00–2.91, Zn 57.5–84.1, and Hg <0.02. Moisture content ranged from 10.44 to 13.72%. Dulse appeared to be able to concentrate metals, with accumulation coeff. of 200 for Cu, 10 000 for Zn, and 3000 for As. AL

4

[Swiss food handbook. Instalment 16.] Schweizerische Lebensmittelbuch. 16. Lieferung. [Book]
Switzerland, Schweizerische Lebensmittelbuchkommission; Switzerland, Eidgenössische Gesundheitsamt
69pp. (1979) [De] Berne, Switzerland; Drucksachen- & Materialzentrale

This 16th installment of this loose-leaf handbook comprises Chapter 45, Heavy metals. It covers analytical methods (including AAS, polarographic and photometric techniques) for detn. of heavy metals, including As, Sb, Ba, Pb, Cd, Cr, Cu, Ni, Hg, Se, Th, Bi, Zn and Sn. Methods for ashing of the food sample under test are also given. A subject index is included. [See FSTA (1979) 11 8A580 for the previous part.] AJDW

5

[A pressure decomposition device for fast treatment of large amounts of biological and organic matter and its application to the determination of trace quantities of heavy metals.]
Druckaufschlusseinrichtung für die schnelle Aufbereitung von grösseren Substanzmengen aus Biomaterialien und organischen Substanzen zur analytischen Erfassung von Schwermetallspuren.
Scheubeck, E.; Gehring, J.; Pickel, M.
Zeitschrift für Analytische Chemie 297 (2/3) 113–116 (1979) [7 ref. De, en] [Siemens AG, Postfach 3240, D-8520 Erlangen, Federal Republic of Germany]

A cylindrical pressure vessel with fast safety lock was used in a pressure decomposition apparatus developed for rapid combustion of biological samples (up to 20 g) in O_2. The construction and chemical resistance of the material allow high recovery rate of Hg, As, Cd and Pb at 50–250 ng/g from meat, dairy products, vegetables and fats. The equipment is easy to handle and needs only cooling water and electric power supply. The principle, construction and operation are described, but no results of detn. are given. RM

6

[Heavy metal contamination of foods in Austria: arsenic contents in foods, and the potential monthly intake.] Schwermetallbelastung der Nahrung in Österreich: Arsen-Gehalte in Lebensmitteln und monatliche Aufnahme.
Woidich, H.; Pfannhauser, W.
Deutsche Lebensmittel-Rundschau 75 (6) 190–195 (1979) [18 ref. De, en, fr] [Forschungsinst. für Ernährungswirtschaft, Blaasstrasse 29, A-1190 Vienna, Austria]

This paper includes data for the As-contamination (max., min. and mean values) of 1000 samples of foods of various types available in Austria, including meat and meat products, fish, eggs, milk and dairy products, fats, bread and other cereal products, sugar and confectionery, fruit, vegetables, condiments and beverages. Canned fish and the highest As concn. (mean value 2914 μg/kg, max. 34 753 μg/kg). The likely monthly As intake from the diet by adults and infants is calculated; the value for adults is 0.81 mg, that for infants increases from 0.03 to 0.15 mg from 1 to 12 months of age. Apart from fish products, As concn. in foods were far below the FAO/WHO max. acceptable values. AJDW

7

A simplified determination of arsenic and selenium in potable and saline water by flameless atomic absorption.
Stein, V. B.; Canelli, E.; Richards, A. H.
Abstracts of Papers, American Chemical Society 177 (1) ENVR 235 (1979) [En] [Environmental Health Cent., Div. of Lab. & Res., New York State Dep. of Health, Albany, New York 12201, USA]

Samples are filtered, adjusted to pH 3.0 ± 0.1, and $Ni(NO_3)_2$ (0.05% Ni for As, 0.2% for Se) and $Ca(NO_3)_2$ (100 mg Ca/l) are added (to potable samples). 20μl samples are injected into a heated graphite furnace for flameless AAS. Analyte concn. are calculated by calibrating the known concn. of standards in deionized

water. Performance of the method with As and Se, resp., is reported as follows (for saline water; results for potable samples are stated to be similar): recommended concn. range 5.0–50 and 10–100 μg/l; detection limit 0.5 and 2.5 μg/l; relative s.d. (n = 10) 15.4 (at 5.0 μg As/l) and 4.8 (at 25 μg Se/l); and % recovery (± s.d.) 102 ± 7 and 99 ± 6. 20 samples may be analysed/h. The method of standard additions may be required with sulphate concn. of ≥70 mg/l. DIH

8

A study of arsenic speciation in oysters.
Diamondstone, B. I.; Hanamura, S.
Abstracts of Papers, American Chemical Society 177 (1) ANAL 99 (1979) [En] [Nat. Bureau of Standards, Nat. Measurement Lab., Cent. for Analytical Chem., Washington, DC 20234, USA]

A new separation technique has been studied which will permit various forms of As to be determined in oysters. An important advantage of this procedure is that, in contrast to traditional digestion procedures, existing spp. of As remain unaltered during separation. In addition, this technique may be applied to other elements which can exist in more than one form in biological materials. The different As spp. are separated by a newly developed thermal separation technique which utilizes the differences in their evaporation temp. The vapourized spp. can then be either directly measured by plasma emission spectrometry or collected in a cold trap. The samples collected in the cold trap can then be analysed by any suitable analytical technique. In addition, plasma emission spectrometry will determine which temp. ranges must be monitored in order to collect the individual As spp. and is capable of the high sensitivity necessary to measure the As emission. A study has been carried out to determine total As recovery for this technique by comparison with other more traditional procedures. AS

9

Methods of test for sodium tripolyphosphate (pentasodium triphosphate) and sodium pyrophosphate (tetrasodium pyrophosphate) for industrial use. XII. Condensed phosphates for industrial use (including foodstuffs). Determination of arsenic content. Silver diethyldithiocarbamate photometric method.

United Kingdom, British Standards Institution
British Standard BS 4427 :Part 12, 3pp. ISBN 0-580-10853-8 (1979) [En] [2 Park Street, London W1A 2BS, UK]

This standard is identical with ISO 5372-1978 [see FSTA (1979) 11 7U456].

10

Soil and plant arsenic residues resulting from treatment with three arsenical herbicides.
Woolson, E. A.; Isensee, A. R.
Abstracts of Papers, American Chemical Society 177 (2) PEST 1 (1979) [En] [Pesticide Degradation Lab., USDA, SEA, Beltsville, Maryland 20705, USA]

As is present in all living plants as a natural constituent. The use of arsenical herbicides may result in increased soil and plant residue levels. Soybeans and radishes were grown for 7 years on soil treated annually with sodium arsenite, monosodium methane arsenate, or cacodylic acid. Applications were incorporated before planting at 1, 2 and 10 × the max. labelled rates (9.0, 5.6 and 11.2 kg active ingredient/ha resp.). Both plant spp. showed phytotoxicity at the 10 × rate. Plant and soil residues were proportional to the number of applications and rates. Residues in both crops were not significantly above controls at the max. labelled rate, regardless of the As source. Radishes, however, contained higher residues than soybeans on a fresh wt. basis. Based on observations from this study, the arsenical herbicides can be used as labelled with little danger of significantly increasing soil or plant residues. AS

11

[Contents of trace elements in shells of short-necked clam in Tokyo Bay.]
Yasuno, T.; Ogino, S.; Ono, A.; Ohata, T.; Endo, F.
Annual Report of Tokyo Metropolitan Research Laboratory of Public Health 28 (1) 156–162 (1977) [16 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo, 160 Japan]

Trace elements were determined by AAS, in 22 samples of short-necked clam taken from 5 sampling locations in Tokyo Bay, during May–Sept. AAS conditions and results for each sample are tabulated in En. Mean contents were (p.p.m.); As 0.085, Cd 0.09, Pb 0.18, Cu 1.24, Cr 0.022, Zn 3.73, Fe 32.5, Mn 16.2, Mg 157, Sr 1496 and total Hg 0.034. Significant differences between sampling locations were noted for Pb, Cu, Zn, Fe and Sr. [From En summ.] DIH

12

[Study of trace elements in marine fish. III. Distribution of arsenic and heavy metals in seabass tissue.]
Yasuda, K.; Katsuki, Y.; Ueda, K.; Noai, Y.
Annual Report of Tokyo Metropolitan Research Laboratory of Public Health 28 (1) 121–126 (1977) [24 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo, 160 Japan]

39 seabass 42–70 cm in length were caught at various locations off Japan and contents of heavy metals in muscle and internal organs were determined. Mean concn. (p.p.m. wet basis) in muscles were: methylmercury 0.23, total Hg 0.28, As 0.41, Cd <0.01, Pb 0.04, Zn 4.5, Cu 0.25, Co 0.02, Cr 0.02 and Mn 0.04. Cd concn. was lower, and Pb higher, than that in bonito tissue [see Part II, FSTA (1977) 9 2R55]. Hg tended to accumulate in muscle rather than viscera. A separate study of young fish showed that total Hg concn. in muscle increased with body length, from 0.01 to 0.03 p.p.m. with corresponding increase in length from 5–9 cm to 34 cm. As concn. was unaffected by length. There were no significant differences among the 39 mature seabass in heavy metal content with regard to location. [From En summ.] DIH

13

Effects of arsanilic acids on growth, serum enzymes, hematologic values, and residual arsenic in young swine.
Ferslew, K. E.; Edds, G. T.
American Journal of Veterinary Research 40 (10) 1365–1369 (1979) [34 ref. En] [Dep. of Preventive Med., Coll. of Vet. Med., Univ. of Florida, Gainesville, Florida 32610, USA]

38 male Poland China/Landrace swine (3 wk of age at the start of the trial) were used in a study on effects of feeding diets containing 0.01% arsanilic acid for 31 days on growth, and on As residues in tissues of animals slaughtered 0, 3, 5 or 7 days after the end of the period on an arsanilic acid-containing diet. Control animals received a diet without arsanilic acid. Results show that dietary arsanilic acid considerably increased As concn. in kidney tissue, from <0.1 mg/kg for control animals to 0.6–0.9 mg/kg at the end of the period on the experimental diet. After withdrawal of dietary arsanilic acid, As concn. in the kidney decreased rapidly reaching levels of <0.1 mg/kg after 7 days. Liver As concn. were also increased by dietary arsanilic acid, reaching a max. concn. of approx. 2 mg/kg; As concn. decreased after withdrawal of dietary arsanilic acid, reaching 0.1–0.2 mg/kg after 7 days. As residues in adipose tissue and muscle tissue remained <0.1 mg/kg throughout the study. AJDW

14

[Residues of arsenic in slaughter pigs after intake of feed with different amounts of arsanilic acid.] Zur Bildung von Arsen-Rückständen in Schlachtschweinen nach Aufnahme von Futter mit unterschiedlichen Gehalten an Arsanilsäure.
Suren, K.; Kreuzer, W.
Schlachten und Vermarkten 79 (7) 203–209 (1979) [25 ref. De, en, fr] [Inst. für Hygiene & Tech. der Lebensmittel tierischen Ursprungs, Veterinärstrasse 13, 8000 Munich 22, Federal Republic of Germany]

62 pigs were given 50, 100 and 200 p.p.m. arsanilic acid (AA) with the feed for 21 days (17.25, 34.50 and 69.00 p.p.m. As). Half the pigs on 100 p.p.m. AA were also given 50 p.p.m. sulphamethasine and 40 p.p.m. furazolidone. All the pigs on 50 and 100 p.p.m. AA were slaughtered after 1 day's withdrawal, the pigs on 200 p.p.m. after 1, 3, 6, 9 and 18 days withdrawal time. 20 g samples from muscles, liver and kidney were analysed for As. Mean As contents in the liver, kidney and muscle after 1 day's withdrawal were 1.15, 0.41 and 0.09 (50 p.p.m. AA), 1.51, 0.64 and 0.13 (100 p.p.m. AA), 2.76, 1.24 and 0.22 (200 p.p.m. AA) p.p.m. on fresh wt. resp., vs. 0.07, 0.06 and 0.06 in controls. After 9 days withdrawal, concn. fell to 0.61, 0.33 and 0.11, and after 18 days to 0.18, 0.15 and 0.10 p.p.m. in liver, kidney and muscle resp. The biological ½ life of As was 4.2 days in liver, 5.7 days in kidney and 15 days in muscle. No interaction was observed between AA and the 2 other drugs. Pigs given ≥100 p.p.m. AA were more fatty, though not on the basis of backfat thickness alone. RM

15

[Curative mineral drinking waters, medicinal and natural table waters. Determination of arsenic ions.]
Union of Soviet Socialist Republics, Gosudarstvennyi Komitet SSSR po Standartam
Soviet Standard **GOST 23268.14–78, 7pp. (1978) [Ru]**

This standard stipulates conditions for detn. of As ions in the title waters by (i) a colorimetric method, involving reduction of the As compounds to arsenic hydride and subsequent reaction with mercuric chloride and (ii) a bromatological arbitration method, involving oxidation of As^{3+} ions to As^{5+} ions by a bromide/bromate solution in a strongly acid medium. Limits of detection are 5×10^{-4}–6×10^{-3} mg As ions and 0.5–3.0 total $As^{3+} + As^{5+}$ ions/sample, for (i) and (ii) resp. Max. permissible deviation between 2 parallel detn. is 1×10^{-3} mg and 3%, resp. KME

16

[Heavy metal contents in deep-sea fishes.]
Kobayashi, R.; Hirata, E.; Shiomi, K.; Yamanaka, H.; Kikuchi, T.
Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 45 (4) 493–497 (1979) [16 ref. Ja, en] [Lab. of Food Hygienic Chem., Tokyo Univ. of Fisheries, Konan, Minato-ku, Tokyo 108, Japan]

In order to find whether deep-sea fish were safe to eat, heavy metal contents were determined in the muscles of 16 spp. caught off New Zealand and Patagonia. Heavy metal contents (p.p.m.) were as follows: 0.04–0.46 total Hg; 0.02–0.44 methylmercury; 0.08–0.46 Se; trace–0.03 Cd; 4.3–10.9 Zn; trace–0.53 Pb; and 0.12–9.99 As. The Hg contents of dory, *Cyttoidopus* sp. and tarakihi, *Cheilodactylus macropterus*, exceeded the temporary regulatory level of Hg in fish and shellfish. Contents of Se, Cd, Zn, and As in muscles of deep-sea fish were about the same as those of commercial fish, but Pb was present at somewhat higher levels in muscles of deep-sea fish. In dory muscle the amounts of total Hg and methylmercury were found to be proportional to body wt. There exists a significant correlation between the depth at which fish were caught and total Hg content, i.e. the deeper the fish live, the higher the total Hg found. AS

17

[Lead, cadmium and arsenic contents in meat and organ samples of game from areas with varying heavy metal contamination.] Blei-, Cadmium- und Arsengehalte in Fleisch und Organproben von Wild aus unterschiedlich schadbelasteten Regionen.
Holm, J.
Fleischwirtschaft 59 (9) 1345–1349 (1979) [many ref. De, en] [Staatliches Veterinäruntersuchungsamt Braunschweig, Dresdenstrasse 6, 3300 Braunschweig, Federal Republic of Germany]

Pb, Cd and As contents were determined in the liver and kidneys of hares, pheasants, ducks, roe deer and red deer and in the meat of hoofed animals (deer, wild sows and boars). Results are tabulated with regard to

browsing conditions, i.e. animals from agricultural areas, browsing in fields, woodlands, near a town, or in an immission area. Only slight metal contamination was observed in the skeletal muscle of hoofed game (Pb 0.04–0.07, Cd 0.005–0.03, As 0.005–0.010 p.p.m., on fresh wt. basis), but fairly heavy Pb and Cd contamination in the organs (mean Pb 1.5–1.8 p.p.m. in hare liver, 1 p.p.m. in hare kidneys, 0.25–0.40 p.p.m. in liver and kidneys of hoofed game). Higher Pb contents were found in red deer from the Harz mountains (0.51–1.94 p.p.m. in liver, 0.75–2.45 p.p.m. in kidneys). The heaviest contaminations were observed in the organs of animals from an immission area (e.g. max. Pb contents in hare liver 21.22 p.p.m., in duck liver 7.25, in roe deer liver 3.69; corresponding levels in kidneys 10.07, 33.04 and 10.31 p.p.m.). Cd contents in the kidneys were affected mainly by the age of the animals and varied between 0.5 and 12.0 p.p.m., in livers between 0.05 and 1.3 p.p.m. except for the immission area (max. 16.39 in livers, 121.05 in kidneys). As contents were 0.005 to 0.010 p.p.m., and presented no problems. It is suggested that game kidneys be discarded, and care exerted in marketing game from immission areas. [From En summ.] RM

18

Simultaneous determination of arsenic and antimony in environmental samples by radiochemical neutron activation analysis.

Rengan, K.; Haushalter, J. P.; Jones, J. D.

Journal of Radioanalytical Chemistry 54 (1/2) 347–353 (1979) [13 ref. En] [Chem. Dep., E. Michigan Univ., Ypsilanti, Michigan 48197, USA]

A radiochemical separation procedure using an inorganic exchanger, tin dioxide (TDO), for the separation of As from Sb is reported. This separation avoids the interference of 564 keV gamma-ray of ^{122}Sb in the measurement of the 559 keV gamma-ray of ^{76}As in neutron activation analysis. Environmental samples, after neutron irradiation and digestion, are taken up in 1M HCl-0.1M HF and passed through a TDO column which selectively retains As. The effluent from the TDO column, after proper conditioning, is passed through an anion exchange column for quantitative retention of Sb. The procedure has been utilized for As and Sb detn. in NBS Orchard Leaves and NBS Albacore Tuna. AS

19

A colorimetric method for the determination of arsenite, arsenate, monomethylarsonic acid, and dimethylarsinic acid in biological and environmental samples.

Lakso, J. U.; Rose, L. J.; Peoples, S. A.; Shirachi, D. Y.

Journal of Agricultural and Food Chemistry 27 (6) 1229–1233 (1979) [28 ref. En] [Shool of Pharmacy, Univ. of the Pacific, Stockton, California 95211, USA]

A spectrophotometric method is described for detn. of arsenite, arsenate, monomethylarsonic acid, and dimethylarsinic acid in biological and environmental samples. The arsenic species are volatilized to their corresponding arsines after reduction by sodium borohydride. The arsine and methylarsines form 2 different colour complexes with silver diethyldithiocarbamate. By use of simultaneous spectrophotometric equations, the amount of each arsine may be determined. The quantitative limit is 1.0 μg elemental As for all 4 arsenic species. Recoveries of 90–100% of all 4 arsenic species from albumin, plant extracts, plasma, urine, and water are reported. AS

20

[Toxic trace elements in foods.] Toxische Spurenelemente in Lebensmitteln.

Treptow, H.; Bielig, H. J.

Verbraucherdienst, B 23 (7) 163–166 (1978) [De] [Inst. für Lebensmitteltech., Tech. Univ., Berlin]

A total of 164 samples of 22 types of vegetables (not including root vegetables) and 88 samples of 10 types of fruit were analysed for As, Cd, Pb and Hg by flameless AAS. As concn. in vegetables ranged from 0.016 mg/kg for green beans to 0.50 mg/kg for spinach; values for fruit ranged from 0.033 mg/kg (various types) to 0.19 mg/kg for apples. Pb concn. in vegetables were <0.3 mg/kg, except for parsley (≤ 1.02 mg/kg) and spinach (≤ 0.93 mg/kg). Pb concn. in fruit were <0.3 mg/kg except for 2 apple samples which contained ≤ 0.433 mg/kg. The highest Cd concn. in vegetables were recorded for chives (0.082 mg/kg), spinach (0.069 mg/kg) and parsley (0.058 mg/kg); all fruit contained ≤ 0.03 mg Cd/kg, except for 1 apple sample with 0.116 mg/kg. All Hg concn. were below the recommended limit of 50 parts/billion. Heavy metal levels in fungi are briefly considered (no experimental data given). The role and activities of the Central Institution for Recording and Evaluation of Environmental Chemicals in the Federal Republic of Germany are briefly discussed. AJDW

21

[Studies on residues of added metals in grape must after fermentation.] Untersuchungen zum Verbleib von Schwermetallen, die Traubenmost zugesetzt wurden, nach Ablauf der Gärung.

Mohr, H. D.

Weinberg und Keller 26 (7) 277–288 (1979) [11 ref. De, en] [Biol. Bundesanstalt für Land- & Forstwirtschaft, Inst. für Pflanzenschutz im Weinbau, Bernkastel-Kues/Mosel, Federal Republic of Germany]

In fermentation tests with artificially contaminated Riesling musts of 1976 and 1978, the effects of heavy metals on fermentation, and their elimination were investigated. The following results were obtained: inhibition of fermentation only occurred at fairly high concn., the toxicity increasing in the following order: Zn, Co, Cr^{6+}, Tl, V (≤ 500 p.p.m.) < Pb (200–400 p.p.m.) < Ni, Cr^{3+} (250 p.p.m.) < Se (50–100 p.p.m.) < Cu (25–50 p.p.m.) < As (10–25 p.p.m.) < Hg (5–10 p.p.m.) < Cd (2–5 p.p.m.); the rate of elimination after fermentation increased as follows: Zn, Co, Ni, Cr^{3+} (about 0%) < As (12–33%) < Cd (34–79%) < Pb (51–90%) < Cu, Hg, Se (86–100%). The formation of insoluble metal sulphides was a decisive factor for the elimination of metals from musts. AS

22

Determination of arsenic in some Lake Michigan fish using neutron activation analysis.

Nicholson, L. W.; Rengan, K.

Journal of Radioanalytical Chemistry 54 (1/2) 355–360 (1979) [12 ref. En] [Eastern Michigan Univ., Ypsilanti, Michigan 48197, USA]

The level of As in 6 different spp. of fish collected from Lake Michigan near Saugatuck was measured using radiochemical neutron activation analysis. Concn. of As was found to vary from 0.05 µg/g (wet wt.) for yellow perch fillet to 1.4 µg/g (wet wt.) for eviscerated bloater chubs. A significant correlation was observed between As concn. and number of years in the lake for lake trout; correlations were also observed between As concn. and length of lake trout and smelt; no such correlations were found for alewife or yellow perch. AS

23

Drinking water – determination of lead, selenium and arsenic contents.

Oman, Ministry of Commerce & Industry

Omanian Standard OS 15, 29pp. (1979) [En, Ar]

This standard specifies methods for the detn. of contents of Pb (by colorimetry), Se (by photometry) and As (using Gutzeit generator) in drinking water. A list of Omanian standards relating to drinking water is appended. KME

24

[Trace elements in nutrition of babies: arsenic, lead, cadmium.] Spurenelemente in der Kleinkindernahrung: Arsen, Blei, Cadmium.

Woidich, H.; Pfannhauser, W.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 170 (2) 95–98 (1980) [18 ref. De, en] [Forschungsinst. der Ernährungswirtschaft, Blaasstrasse 29, A-1190, Vienna, Austria]

Dietary intake of As, Pb and Cd by babies in the 1st 12 months was studied. Tabulated data give contents of the 3 elements in milks, infant formulae and infant foods. Contents of As in dried milks, cereal formulae and foods in jars were (µg/kg): 10.0–13.4, 30.8 and 13.7–16.5, resp. Corresponding figures for Pb were (mg/kg) 0.12–0.15, 0.14–0.15, and 0.10–0.11 and for Cd were (mg/kg) 0.02–0.031, 0.032–0.041 and 0.0021–0.032. The relative excess of As in cereal foods was noted. Total intake of the trace elements was calculated for adults and babies on a µg/kg body wt. basis; intake of Pb by babies was higher than that by adults. Regular control of infant foods for harmful trace elements is recommended. DIH

25

Arsenic concentration in canned tuna fish and sardine.

Karapetian, J. V.; Shahmoradi, A. M.

Bulletin of Environmental Contamination and Toxicology 20 (5) 602–605 (1978) [7 ref. En] [Dep. of Toxicol., Coll. of Pharmacy, Tehran Univ., Tehran, Iran]

As concn. of 20 samples of (i) canned tuna fish from the Persian Gulf and 10 samples of (ii) canned sardine from the Caspian Sea were determined. The contents of the cans were ground, homogenized, digested in a mixture of nitric-sulphuric acid and determined by the silver diethyldithiocarbamate spectrophotometric method. Range of As concn. in (i) and (ii) resp. was: 0.65–1.00 and 0.9–1.20 p.p.m., and the mean of the concn. was 0.78 and 1.00 p.p.m. resp. The results were compared with the tabulated results of previous researches. VJG

26

[Analytical characteristics of the pressure digestion method for organic materials.] Analytische Eigenschaften des Druckaufschlusses organischer Substanzen.

Plesch, R.

Zeitschrift für Analytische Chemie 298 (5) 400–403 (1979) [3 ref. De, en] [Siemens AG, Bereich Mess- & Prozesstechnik, Postfach 211080, D-7500 Karlsruhe 21, Federal Republic of Germany]

In connection with the recently introduced pressure digestion method for organic materials [FSTA (1979) 11 11S1713], data for the recovery rates of 50–500 parts/billion Hg, As, Pb and Cd in beef and pork meat, liver and kidneys from 142 digestions were examined by photometry, AAS and X-ray fluorescence analysis (XFA). Statistical evaluation showed that the recovery rate at <1 p.p.m. was independent of the concn. and of the matrix. The global mean recovery for each element was $>90\%$, allowing very wide application of the method (i.e. 90.2% for Hg, 90.7 for As, 94.8 for Pb, 93.8 for Cd). The mean s.d. for single results was 5.2% for AAS, 6.2 for XFA and 8.9 for photometry. RM

27

[Use of electronic data processing in evaluation of residue determinations as exemplified by heavy metals.] Einsatz der elektronischen Datenverarbeitung bei der Auswertung von Rückstandsuntersuchungen am Beispiel der Schwermetalle. [Lecture]

Schmidt, E. H. F.

Proceedings of the European Meeting of Meat Research Workers No. 24, L9:1–L9:7 (1978) [De, en, fr, ru] [Zentrale Erfassungs- & Bewertungsstelle für Umweltchemikalien, Bundesgesundheitsamt, Postfach, D-1000 Berlin 33]

The procedures for collection and evaluation of data on environmental chemicals and the software and hardware used for the purpose in the author's Establishment are described. The reports are available to the Federal and Länder Governments and, within data protection limitations, also to others interested. [See FSTA (1980) 12 8S1280.] SKK

28

Developments in land methods of wastewater treatment and utilisation. [Conference proceedings]

Jenkins, S. H. (International Association on Water Pollution Research) (Editor)

Progress in Water Technology 11 (4/5) 1–532 (1979) [many ref. En]

This issue of the journal contains the proceedings of a conference on developments in land methods of wastewater treatment and utilization, held in Melbourne, Victoria, Australia on 23–27 Oct. 1978. Papers include: Environmental sources of heavy metals and their toxicity to man and animals, by E. J. Underwood (pp. 33–45, 45 ref.). Heavy plant [heavy

metals] accumulation in soils irrigated by sewage and effect in the plant-animal system, by K. J. Evans, I. G. Mitchell & B. Salau (pp. 339–352, 14 ref.). Investigations on the use of sludge as a fertilizer in a market garden area north of Adelaide, South Australia, by M. P. C. de Vries (pp. 445–450, 10 ref.). Elimination mechanisms by soil filtration and application as a hillside seepage system in the area of a reservoir for potable water, by A. Grau (pp. 459–472). One paper is abstracted separately in FSTA and can be found in the author index under International Association on Water Pollution [Wastewater Symposium]. AL

29

Residues of lead and arsenic in crops cultured on old orchard soils.
Kenyon, D. J.; Elfving, D. C.; Pakkala, I. S.; Bache, C. A.; Lisk, D. J.
Bulletin of Environmental Contamination and Toxicology 22 (1/2) 221–223 (1979) [16 ref. En] [Dep. of Pomology, Pesticide Residue Lab., New York State Coll. of Agric. & Life Sci., Cornell Univ., Ithaca, New York 14853, USA]

High concn. of Pb and As are found in the upper few cm of apple orchard soils where insecticide compounds such as lead arsenate and calcium arsenate have been used for many yr. 5 crops (sweet corn, cucumber, musk melon, summer squash and tomato) were planted on loam soil which was formerly orchard land near Interlaken, New York, and which had received applications of Pb and As compounds for many yr. The same plants were grown on non orchard soil to serve as controls. At maturity, the edible portion of each crop was harvested, and Pb determined by conventional anodic stripping voltammetry and As by silver diethyldithiocarbamate spectrophotometric procedure. As and Pb were also determined in the soil. No significant differences ($p > 0.05$) between the treatments were observed in the concn. of As and Pb using Wilcoxons signed rank test. No phytotoxic effects were seen in any of the crops that could be attributed to As residues in the orchard soil. VJG

30

Performance and tissue mineral composition of ruminants fed cage layer manure in combination with monensin.
Pravee Vijchulata; Henry, P. R.; Ammerman, C. B.; Becker, H. N.; Palmer, A. Z.
Journal of Animal Science 50 (1) 48–56 (1980) [25 ref. En] [Dep. of Anim. Sci., Univ. of Florida, Gainesville, Florida 32611, USA]

24 steers, average initial wt. 256 kg, were used in a 2 × 3 factorial arrangement of treatments to determine the effect of monensin (22 g/t) in combination with 3 levels of cage layer manure (CLM) from poultry as a replacement for soybean meal in finishing diets. Average daily gains, feed intake and feed conversion, and ruminal propionic acid concn. were determined for 0, 12.5 and 25.0% CLM with and without monensin. Carcass evaluation showed no significant differences due to these feeding treatments in quality or yield grades, dressing %, or flavour or juiciness of broiled steaks. Addition of CLM increased Ca ($P < 0.01$) in muscle, Cu ($P < 0.01$) in liver, Mg ($P < 0.01$) and P ($P < 0.05$) in kidney, As ($P < 0.05$) in kidney and muscle, and decreased Fe ($P < 0.05$) in kidney. Levels of As, Pb, Cd and Hg did not accumulate to levels harmful to ruminants. AL

31

[Uptake, distribution and persistence of arsenic in slaughter pigs after arsanilic acid feeding.] Zur Aufnahme, Verteilung und Verweildauer von Arsen (As) bei Schlachtschweinen nach Verfütterung von Arsanilsäure (ASS). [Lecture]
Kreuzer, W.; Suren, K.
Proceedings of the European Meeting of Meat Research Workers No. 24, L10:1–L10:6 (1978) [11 ref. De, en, fr, ru] [Inst. für Hygiene & Tech. der Lebensmittel tierischen Ursprungs, Univ. München, Munich, Federal Republic of Germany]

A total of 49 German Landrace pigs, live wt. about 100 kg, received arsanilic acid (AA) in their rations as follows: 10 received 40 p.p.m. in ration DM for 3 wk to the eve of slaughter; 5 received 50 p.p.m., and 5 received 100 p.p.m. for 21 days to the eve of slaughter; and 29 received 200 p.p.m. for 21 days, and were slaughtered in groups (of mostly 6) 1, 3, 6, 9, and 18 days after cessation of AA administration; 6 other pigs served as controls. Arsenic contents were determined in carcass muscle, liver and kidney samples of all variants. The results are tabulated and graphically presented in detail. Mean values for As contents (p.p.m. in fresh wt.) of tissues of pigs slaughtered 1 day after AA administration for 21 days at 0, 50, 100 and 200 p.p.m. in ration were resp.: liver 0.07, 1.15, 1.51 and 2.76; kidney, 0.06, 0.41, 0.64 and 1.24; and muscle, 0.06, 0.09, 0.13 and 0.22. The half-lives of As were 4.2 days in liver, 5.7 days in the kidneys, and 15 days in the muscles. As contents of livers and kidneys of pigs given the 200 p.p.m. level of AA were still above the legal tolerance level of 0.25 p.p.m. in fresh tissue 18 days after cessation of administration. [See FSTA (1980) 12 8S1280.] SKK

32

Studies on the chemical nature of and bioavailability of As, Cd and Pb in selected marine fishery products.
Uthe, J. F.; Freeman, H. E.; Sirota, G.; Chou, C. I.
Abstracts of Papers, American Chemical Society 178 (1) AGFD 18 (1979) [En] [Fisheries & Oceans Canada, PO Box 550, Halifax, Nova Scotia, Canada B3J 257]

Current food safety agencies assume that compounds of toxic elements occurring in foods are equitoxic and set tolerances based upon total levels of the toxic element. Research into the nature of naturally occurring As in flatfish has shown that the major form of As is a stable, water soluble, compound rapidly excreted by man in the urine. Little inorganic As was present in fish tissue. A study comparing the bioavailability to rats of 3 dietary forms of Cd ($CdCl_2$/casein; naturally occurring Cd in canned lobster digestive gland and Cd in canned kidney/liver preparation from pigs injected with low doses of $CdCl_2$) showed marked differences in bioavailability in spite of the diets containing equivalent amounts of protein, calories, Ca, Se and Zn. Development of analytical methodology for the

determination of tetraalkyl lead compounds in fish products indicated that tetraalkyl lead compounds account for substantial percentages of the total Pb content of these products. AS

33

[Present knowledge of heavy metals in milk and milk products.] Schwermetalle in Milch und Milchprodukten, gegenwärtiger Stand der Kenntnisse.
Carl, M.
Landwirtschaftliche Forschung Sonderheft 34/I, 95–102 (1978) [16 ref. De, en, fr] [Milchwirtschaftliche Untersuchungs- & Versuchsanstalt, Hirnbeinstrasse 10, D-8960 Kempten, Federal Republic of Germany]

An examination of information on contamination of milk and milk products with As, Pb, Cd, Hg, Sn, Cu and Fe shows considerable variations and analytical errors. The avoidance of errors and suitable estimation methods are discussed. Milk contributes only slightly to the total dietary intake of toxic heavy metals.

Comparisons of Hg estimation by various methods showed the magnitude of systematic errors. Sources of systematic errors and their avoidance are discussed and a modification of Vondenhof & Beindorf's method [FSTA (1976) 8 10C494] is described which avoids systematic errors and allows reliable detection of contaminations. RM

34

Clinical epidemiological studies on endemic chronic arsenic poisoning in children and adults, including observations on children with high- and low-intake of dietary arsenic.
Zaldivar, R.; Ghai, G. L.
Zentralblatt fur Bakteriologie, 1B 170 (5/6) 409–421 (1980) [34 ref. En, de] [Int. Res. Group for Cancer Epidemiology & Environmental Hygiene, Suite 606, 5055 NW 7th Street, Miami, Florida 33126, USA]

In this study of As contamination of the human environment in the northern provinces of Chile, 42 samples of surface, geyser and well water, 912 samples of drinking water and 212 samples of food were analysed for As content. The mean As concn. in drinking water at Antofagasta Commune for 1955-April 30, 1970 was 0.5980 p.p.m. and for 1 June 1970–30 March 1972 was 0.0815 p.p.m. This decrease was made possible by a water filtration plant which started operation in May 1970. Of 8 spp. of vegetables tested, the levels (mg/100 g) were lowest in tomato (0.014) and carrot (0.030) and highest in celery (0.104) and radish (0.100). Among the foods, fresh cows' milk contained (p.p.m.) 0.083, fresh human milk 0.216, vanilla ice cream 0.156, orange juice 0.120 and pineapple juice 0.390. In 11 varieties of soft drinks and beers, the highest mean levels (p.p.m.) were Pilsner beer 0.553, Malta (dark beer) 0.484 and Escudo (high quality Pilsner beer) 0.388. From Aug. 1968 to May 1969 there was a continuous decrease in the As content of soft drinks (from 0.242 to 0.021) and beer (from 0.600 to 0.117 p.p.m.); this was due to using water treated with aluminium sulphate. The prevalence of symptoms of As poisoning among children from Antofagasta Commune is discussed. AL

35

[Heavy metal content (As, Pb, Cd, Hg) of vegetables which grow above ground, and fruits.] Gehalt an Schwermetallen (Arsen, Blei, Cadmium, Quecksilber) in oberirdisch wachsenden Gemüse- und Obstarten.
Barudi, W.; Bieling, H. J.
Zeitschrift für Lebensmittel-Untersuchung und -Forschung 170 (4) 254–257 (1980) [5 ref. De, en] [Inst. für Lebensmitteltech. – Frucht- und Gemüsetech. – der Tech. Univ., Königin-Luise-Strasse 22, D-1000 Berlin 33]

157 samples of 16 types of vegetable, whose aerial tissues are consumed, and 83 samples of 6 var. of fruit were examined by AAS for As, Pb and Hg contamination. Leafy vegetables were found to be more heavily contaminated than the other vegetable types. Fruits without exception had less heavy metals than vegetables. The results obtained were compared with the guide line values of the German regulatory authority ZEBS [Zentrale Erfassungs- und Bewertungsstelle für Umweltchemikalien] and with the recommendations of WHO for weekly tolerance values for Pb, Cd and Hg. It was determined that the average weekly exposure of the population of the Federal Republic of Germany is below the max. tolerance level. AS

36

Concentrations of arsenic, selenium and ten heavy metals in school shark, *Galeorhinus australis* (Mackay), and gummy shark, *Mustelus antarcticus* Günther, from south-eastern Australian waters.
Glover, J. W.
Australian Journal of Marine and Freshwater Research 30 (4) 505–510 (1979) [13 ref. En]

The max. concn. of As, Cd, Cu, Mn, Se and Zn in the edible flesh of *G. australis* and *M. antarcticus* were found to be 30, 0.08, 0.6, 0.6, 0.8 and 4.8 μg/g wet wt. resp. The concn. of Co, Cr, Pb, Mo and Ni were below the limits of detection of the methods used (0.3, 0.5, 0.1, 0.2 and 0.2 μg/g resp.). Samples for analysis were taken from 1 male and 1 female shark of each sp. caught in 6 areas of S.E. Australian waters and wherever possible the concn. of the elements were correlated with the sp., sex and site of capture. (Samples were taken from the largest shark in each sp., sex and locality category). AS

37

Toxicological evaluation of arsenic in edible seaweed, *Hizikia* species.
Watanabe, T.; Hirayama, T.; Takahashi, T.; Ikeda, M.
Toxicology 14 (1) 1–22 (1979) [33 ref. En] [Dep. of Environmental Health, Tohoku Univ. School of Med., Sendai 980, Japan]

63 samples of *Hizikia* preparations were obtained from market sources, and were analysed for As. The samples showed a wide range of As concn., from 19 to 172 p.p.m. on a dry wt. basis. The mean value was 111.8 p.p.m., and a range from 50 to 150 p.p.m. covered 90% of the samples. Feeding experiments with rats showed that the observed max. no-effect level was considerably higher than the estimated possible human intake of

arsenic from seaweed sources. The possibility that this result might be biased due to special features of As metabolism in rats, or due to effects of *Hizikia* itself on As metabolism, is briefly discussed. JRR

38

Cadmium retention in rats fed either bound cadmium in scallops or cadmium sulfate.
Lagally, H. R.; Biddle, G. N.; Siewicki, T. C.
Nutrition Reports International 21 (3) 351–363 (1980) [25 ref. En][Nat. Oceanic & Atmospheric Administration, Southeast Fisheries Cent., PO Box 12607, Charleston, S. Carolina 29412, USA]

Feeding trials were conducted to compare the effects of dietary sources of Cd and protein on excretion and retention of Cd in weanling rats. Differences were observed in the retention, but not excretion, of Cd after a 4-wk feeding period in which rats received either naturally occurring Cd in calico scallops or Cd as cadmium sulphate added to a standard casein diet; Cd retention was lower in kidneys of rats fed the scallop diet. In a 2nd experiment when equal levels were added to cooked or uncooked low-Cd bay scallop or casein based diets, Cd retention was lower among scallop fed animals. Cooking the scallop did not influence the parameters examined. As with Cd, arsenic was found to accumulate in rat tissues at a higher level when ingested as arsenic trioxide vs. naturally bound As in scallops. SP

39

[Comparative study of methods for estimation of arsenic in foods.]
Velev, S.; Grigorova, A.
Veterinarnomeditsinski Nauki 16 (5) 67–72 (1979) [12 ref. Bg, ru, en][Tsentralen Nauchnoizsled. VetMed. Inst., Sofia, Bulgaria]

Arsenic was added at 5 µg/10 g to White pickled cheese and at 10 µg/10 g to fish (not specified), and As was determined using the molybdenum-blue and the silver diethyldithiocarbamate colorimetric methods of AOAC [See FSTA (1975) 7 7A378 & 379]. Mean recoveries for 21 and 18 samples of cheese and fish resp were 66 and 71% by the molybdate method and 97 and 96% by the silver method. The latter method is recommended for adoption as Bulgarian Standard (BDS). SKK

40

[Changes in the As content of vegetables as a result of domestic processing.] Veränderurg des Gehaltes von Arsen in Gemüsen bei der haushaltsüblichen Zubereitung.
Schelenz, R.
Berichte der Bundesforschungsanstalt für Ernährung No. 3, 77pp. (1980) [14 ref. De, en][Zentrallab. für Isotopentech., Bundesforschungsanstalt für Ernährung, Karlsruhe, Federal Republic of Germany]

Neutron activation analysis studies were conducted on changes in the As concn. of vegetables, (i) cauliflower, (ii) kohlrabi, (iii) French beans, (iv) potatoes, (v) carrots, (vi) Brussels sprouts and (vii) Savoy cabbage, as a result of trimming, washing, peeling, steaming and boiling. Tables of data are given showing pH and TS, ash, As, Pb, Cd and Hg contents of 186 samples of vegetables at the various stages of processing. Initial As concn. in the untrimmed, unwashed, unpeeled vegetables were (µg/kg): (i) 15; (ii) 7.4; (iii) 7.7; (iv) 94; (v) 12; (vi) 28; and (vii) 24. The % decrease in As concn. after trimming, peeling and washing (as appropriate) was (i) 71, (ii) 79, (iii) 28, (iv) 98, (v) 72, (vi) 88 and (vii) 69%. Little further change in As concn. occurred during cooking. The water and salt used in cooking made only minor contributions to the total As content of the cooked vegetables. AJDW

41

[Volatile solvents and pesticide residues in flavourings.] [Review]
Peyron, L.
Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 61 (2) 46–52 (1979) [70 ref. Fr][Lantier Aromatiques, Grasse, France]

This review discusses problems of solvent, pesticide and heavy metal traces in food flavourings in relation to intake, methods of detn. and health hazards. RM

42

Solvent extraction and flameless atomic absorption determination of arsenic in biological materials.
Thiex, N.
Journal of the Association of Official Analytical Chemists 63 (3) 496–499 (1980) [5 ref. En][Dep. of Chem., S. Dakota State Univ., Brookings, S. Dakota 57007, USA]

This method for detn. of As specifies wet digestion of biological materials, followed by reduction of As(V) to As(III) and extraction of As(III) with diethylammonium diethyldithiocarbamate in chloroform. The extract is analysed by flameless AAS. Recoveries of As from plant and animal tissue (including liver, mixed grain, dried beef, wiener) averaged 99% (range 88–108%). Analysis of rat tissues containing ^{74}As and of National Bureau of Standards reference materials was also carried out. The method is sensitive to about 0.04 µg As in the total digest (injections of 20 µl of a 4 ng/ml solution). AL

43

Analysis of foods for lead, cadmium, copper, zinc, arsenic, and selenium, using closed system sample digestion: collaborative study.
Holak, W.
Journal of the Association of Official Analytical Chemists 63 (3) 485–495 (1980) [14 ref. En][FDA, 850 Third Avenue, Brooklyn, New York 11232, USA]

A method for detn. of Cd, Pb, Cu, As, Se and Zn is presented. The method involves digesting a food sample with nitric acid under pressure and using aliquots of the solution for analysis by suitable techniques. Cd, Pb, and Cu are determined by anodic stripping voltammetry (ASV) after heating with equimolar sodium nitrate/potassium nitrate; As and Se are determined by AAS after generation of their respective hydrides; Zn is determined by conventional AAS. The combined recoveries and reproducibilities

(CV_R) of the collaborative study on this multielement analysis are: Cd, 89.14 (17.65) at 0.10–1.0 μg/g; Zn, 96.53 (5.59) at 16.7 and 66.7 μg/g; As, 99.50 (17.02) at 0.5 and 2.0 μg/g; Se, 95.17 (16.52) at 0.5 and 2.0 μg/g; Pb, 92.57 (15.22) at 0.3–3.0 μg/g; and Cu, 108.39 (18.30) at 1.0–10.0 μg/g. The method has been adopted as official first action for Cd, Pb, As, Se, and Zn. AS

44

[Pesticides, metal residues, antibiotics.] [Review] Luquet, F. M.; Mahieu, H.; Mouillet, L.; Boudier, J. F. ***Alimentation et la Vie*** **67** (2) 73–90 (1979) [30 ref. Fr] [ISHA, BP 138, Champlan, 91160 Longjumeau, France]

This review considers organochlorine pesticides, polychlorinated biphenyls, metals (Cu, Fe, Mn, As, Cd, Hg and Pb) and antibiotics residues in milk in France. Regional and seasonal variations are discussed. Mention is also made of the high contamination of human milk with organochlorine pesticide residues. MEG

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FAB 40

ARSENIC IN FOODS

SELECTED FROM VOLUME 13
FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

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Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would, in any case, encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES

EDITOR

1

[Symposium 1978. Current state and achievements of chemical and biological agricultural research.] Kongressband 1978. Stand und Leistung agrikulturchemischer und agrikulturbiologischer Forschung. [Conference proceedings]
Germany, Federal Republic of, Verband Deutscher Landwirtschaftlicher Untersuchungs- & Forschungsanstalten (VDLUFA)
Landwirtschaftliche Forschung Sonderheft 35, 724pp. (1979) [De, en, fr]

The 90th VDLUFA meeting, held in Augsburg on Sept. 18–22, 1978 included the following lectures: Demands of nutrition medicine on the quality of plant foods, by G. Wolfram (pp. 32–42, De, en, fr, 12 ref.). Fertilization and food quality of different cropping systems, by A. Finck (pp. 122–132, De, en, 18 ref.). Uptake of heavy metals by various cultivated plants in a pot trial with a soil of high Cu content, by A. Wünsch, A. Amberger and R. Gutser (pp. 326–334, De, en, fr, 14 ref.). Uptake of heavy metals by various plants in a pot trial from soils with long-term or single application of sewage sludge, by R. Gutser, A. Amberger and A. Wünsch (pp. 335–349, De, en, fr, 32 ref.). Another 19 papers are abstracted individually in FSTA, and are listed in the author index under Germany, Federal Republic of, Verband Deutscher Landwirtschaftlicher Untersuchungs- & Forschungsanstalten (VDLUFA) [90th Symposium]. AJDW

2

[Brief report on field experiments with town waste compost and sewage sludge. Heavy metals in crops.] Ein Kurzbericht über langjährige Feldversuche mit Müllkomposten und Klärschlämmen. Schwermetallgehalte in der Erntemasse. [Lecture]
Kick, H.; Poletschny, H.
Landwirtschaftliche Forschung Sonderheft 35, 412–418 (1979) [5 ref. De, en, fr] [Agrikulturchemisches Inst. der Univ. Bonn, Meckenheimer Allee 176, D-5300 Bonn 1, Federal Republic of Germany]

Effects of urban waste application on heavy metals in soil and crops were studied. Tabulated data showed that the metal contents in fodder beets, sugar beets, potatoes and grain maize were not increased in field experiments on 3 different soils for periods of 20, 9 and 6 yr after application of 98 t/ha over 20 yr, 1800 t/ha in a single application, or up to 250 m^3 liquid sewage sludge/ha. [See FSTA (1981) 13 1A3.] RM

3

[Heavy metal content of hen eggs.] Zum Schwermetallgehalt von Hühnereiern.
Weigert, P.
Zeitschrift für Lebensmittel-Untersuchung und -Forschung 171 (1) 18–19 (1980) [9 ref. De, en] [Vet.-Untersuchungsstelle der Bundeswehr VI, Schleissheimer Strasse 416, D-8000 München 45, Federal Republic of Germany]

Heavy metal contents of hen egg yolk, white and shell (75 eggs) were determined, after freeze-drying of samples followed by wet digestion, by AAS. Moisture contents of egg white and yolk were 88% and 49%, resp. Mean contents and s.d. (in parenthesis) in yolks and whites, resp. were (p.p.m. dry wt.) Pb 0.057 (0.088), 0.085 (0.088); Cd 0.028 (0.049), 0.023 (0.023); Hg 0.006 (0.004), 0.005 (0.002); As 0.348 (0.316), 0.209 (0.180); Se 0.567 (0.544), 0.376 (0.388). No correlations were found between individual metals or between egg components. Systematic monitoring of contents of As, Se and Cd in eggs is recommended. DIH

4

[Lead, cadmium, arsenic and zinc contents in fish from uncontaminated and contaminated inland waters.] Blei, Cadmium-, Arsen- und Zinkgehalte von Fischen aus unbelasteten und belasteten Binnengewässern.
Holm, J.
Fleischwirtschaft 60 (5) 1076–1083 (1980) [9 ref. De, en] [Staatl. Veterinäruntersuchungsamt Braunschweig, Dresdenstrasse 6, D-3300 Braunschweig, Federal Republic of Germany]

Within the framework of a plan for water management, and with reference to a fish re-stocking programme, the metal contents in the muscles and livers of fish from unpolluted and polluted still waters, and from unpolluted, polluted and heavily polluted running waters were determined by wet digestion and AAS. Tabulated results showed much greater metal accumulation in livers than in muscles: in perch and roach, Pb contents of liver were 3–11 ×, and Cd contents 90–600 × as high as in muscle. Metal contents in fish tended to rise with water pollution levels but differed with species. Max. contamination was found in perch, with 0.08 and 0.9 mg Pb/kg in muscle and liver resp., and 0.1 and 62 mg Cd/kg; moderate levels were found in roach, chub and tench with 0.03 and 0.12–0.26 mg Pb/kg, 0.05 and 1.0–7.8 mg Cd/kg in muscle and liver resp. Silver bream and pike came within the lowest range, with 0.01–0.03 and 0.04–0.15 mg Pb/kg, 0.007–0.0 and 0.3–1.5 mg Cd/mg, resp. A clear gradation with the distance from the immission source was also observed with the contamination levels in perch and roach at a distance of 30 km dropping to 1/10 that at 12–15 km, and to 1/100 at a distance of 70 km. The 0.5 mg Pb/kg tolerance level was exceeded only in the muscle of fish caught in 2 places from polluted and heavily polluted water, but Cd contents were above the 0.05 mg/kg tolerance level in 90% of fish muscle from heavily polluted and 29–39% from polluted water. As, Zn and Cu levels are also shown in tables but are not included in discussion of the results. RM

5

Simple semi-automated atomic-absorption spectrometric method for the determination of arsenic and selenium in fish tissue.
Agemian, H.; Thomson, R.
Analyst 105 (1254) 902–907 (1980) [11 ref. En] [Analytical Methods Div., Nat. Water Res. Inst., Canada Cent. for Inland Waters, PO Box 5050, Burlington, Ontario, Canada L7R 4A6]

A simple and safe digestion method has been developed for simultaneous extraction of As and Se from fish tissue. A combination of nitric, perchloric and sulphuric acids is used to dissolve, completely, resistant

high fat fish tissue at high temp. without volatilization losses. Fish samples are digested in test-tubes placed in an aluminium hot-block. Extracts are then analysed automatically by reduction with sodium tetrahydroborate(III) followed by AAS with quartz tube atomization. The recovery of the method when applied to several organoarsenic and organoselenium species and to National Bureau of Standards Standard Reference Materials was satisfactory. AS

6

[Interferences in flameless AAS determination of trace elements. II. Determination of As and Sb in plants.]
Dupire, S.; Hoenig, M.
Analusis 8 (4) 153-158 (1980) [9 ref. Fr, en] [Min. de l'Agric., Inst. de Recherches Chimiques, 5, Museumlaan, 1980 Tervuren, Belgium]

The interference by major elements in flameless AAS detn. of As and Sb with electrothermal atomization was studied. This interference prevents detn. by direct comparison with standard solutions. Absorption of As was considerably reduced by phosphates, but extraction of As halogen compounds according to Yasui et al. [FSTA (1979) 11 7C386] allowed detn. at very low detection limits (0.15 p.p.m. As (DM basis) in spinach). Sb, though subject to the same interferences, could be successfully determined by the standard addition method. RM

7

Acid digestion, hydride evolution atomic absorption spectrophotometric method for determining arsenic and selenium in foods. II. Assessment of collaborative study.
Ihnat, M.; Thompson, B. K.
Journal of the Association of Official Analytical Chemists 63 (4) 814-839 (1980) [9 ref. En] [Agric. Canada, Chem. & Biol. Res. Inst., Ottawa, Ontario, Canada K1A OC6]

Results obtained from the recent collaborative study of hydride evolution AAS method for determining As and Se in foods have been studied intensively. Various parameters relating to the method have been considered: accuracy (excellent agreement between reference data and means over all laboratories for both model solutions and food samples; considerable bias for individual laboratories); precision within laboratory (repeatability coeff. of variation of 0.07-0.15) and among laboratories (reproducibility coeff. of variation of 0.13-0.28); frequency of outlying data from model solutions and biological samples (rejection rate from 9 to 29%); and detection limits (estimated as 80 and 120 ng/g for As and Se, resp.). Attempts were made to interrelate these parameters and to relate them to hydride generator characteristics and to other aspects of the procedure, namely, hydride generator type; absorbance-time peak width; standard curve slope, linearity, and precision; sample type; reagent blank magnitude; collaborator experience with sample treatment and hydride generation procedures, and departures from prescribed sample treatment procedure. On the basis of information from 28 laboratories using 16 different types of hydride generation apparatus conducting 700 complete analyses and 2400 analyte quantitations on reagent blanks, 3 model solutions, and 13 different reference food samples with levels of As and Se ranging from 0 to 15 000 and 0 to 4000 ng/g, resp. the authors conclude that the method suffers from both systematic error and imprecision, and hence recommend that the method not be adopted. [See FSTA (1978) 10 6A339 for part I.] AS

8

Differential pulse polarographic determination of inorganic and organic arsenic in natural waters.
Buldini, P. L.; Ferri, D.; Zini, Q.
Mikrochimica Acta I (1/2) 71-78 (1980) [15 ref. En, de] [CNR-LAMEL Inst., Via de'Castagnoli I, 40126 Bologna, Italy]

As (III), As (V) and organic As in water were determined by differential pulse polarography. The efficiency of the procedure (total As detn.) was 78-80%, detection limit 1 µg/l, relative s.d. better than ±1.5% at 50 µg/l. Interference by heavy metals was eliminated by anion exchange treatment or pre-electrolysis with a Hg cathode. Analysis of 6 spring waters showed 5-11 µg/l total As, 3-6 µg/l organic acid and 98-102% recovery of 100 µg/l spike. RM

9

Identification of arsenobetaine, a water soluble organo-arsenic compound in muscle and liver of a shark, *Prionace glaucus*.
Kurosawa, S.; Yasuda, K.; Taguchi, M.; Yamazaki, S.; Toda, S.; Morita, M.; Uehiro, T.; Fuwa, K.
Agricultural and Biological Chemistry 44 (8) 1993-1994 (1980) [8 ref. En] [Dep. of Agric. Chem., Univ. of Tokyo, Tokyo 113, Japan]

Muscle and liver of 1 female shark contained, resp., 37.4 and 27.7 µg total arsenic/g wet wt. Homogenized samples of muscle and liver were fractionated; in muscle 80% of total As was contained in the aqueous fraction with very little in the lipid fraction. In liver 40% of total As was in the aqueous fraction and 45% in the lipid fraction. Arsenic compounds in aqueous fractions of muscle and liver were characterized by HPLC-inductively coupled plasma spectrometry; the major peak in each case was arsenobetaine (the As analogue of betaine). DIH

10

[Lead, cadmium and arsenic contents in organ samples of sheep from an arid zone, e.g. Algeria.]
Blei-, Cadmium- und Arsengehalte in Organproben von Schafen aus einer ariden Klimazone am Beispiel Algerien.
Holm, J.; Elsarnagawy, D.
Fleischwirtschaft 60 (7) 1387-1388 (1980) [7 ref. De, en] [Staatliches Veterinäruntersuchungsamt Braunschweig, Dresdenstrasse 6, D-3300 Braunschweig, Federal Republic of Germany]

116 merino sheep from 3 different areas of Algeria where there are few or no emissions were examined for Pb, Cd and As concn. in the muscle, liver and kidneys. Tabulated results (mg/kg for mean and range) were: muscle (1 location only) - Pb 0.009, 0-0.17; Cd 0.010, 0.001-0.023; As 0.002, 0.001-0.004; liver (2 locations) - Pb 0.096, 0.024-0.183 and 0.101, 0.006-0.251; Cd 0.050, 0.017-0.075 and 0.078, 0.022-0.200; As 0.007, 0.004-0.013

and 0.006, 0.002–0.010; kidney (3 locations) – Pb 0.204, 0.035–0.622; 0.224, 0.075–0.493; 0.190 (2 samples only); Cd 0.089, 0.010–0.154; 0.238, 0.042–0.535; 0.151 (2 samples); As 0.006, 0–0.025; 0.007, 0.004–0.017; 0.008 (2 samples). The Pb concn. in the livers were 3–4 times lower than those found in Bavaria [see *Fleischwirtschaft* (1979) **59**, 241], but other values were not significantly

11

[Heavy metals in aroma compounds.]
Cottalorda, A. M.; Senaux, M. S.
Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol **61** (5) 195–201 (1979) [32 ref. Fr] [Lautier Aromatiques, Grasse, France]

This review discusses sources of trace metals in flavour compounds; toxicological problems; international standards in foods, food additives and flavours; methods of detn. for As, Cd, Pb; Codex Alimentarius and French limits for As, Cu, Cd, Hg, Fe, Pb and Sn; FDA limits for As, Cu, Pb and Zn, Sb, Cd, F, Hg, Se and Sn; and mean annual consumption/capita in France of Cd from flavours and foods in various groups of food are appended. RM

12

[TLC separation and determination of methanearsonic acid in soil, rice grains and straw.]
Abe, H.; Anma, K.; Ishikawa, K.; Akasaki, K.
Japan Analyst [Bunseki Kagaku] **29** (1) 44–48 (1980) [13 ref. Ja, en] [Kumiai Chem. Ind. Co. Ltd., Shizuoka, Japan]

A method is described for detn. of methanearsonic acid (MAA) residues in soil, rice and straw, involving digestion of MAA to arsenic acid and detn. at 520 nm. Average recovery from rice grains was 80.6%. Of other As compounds tested, only arbazid (methylarsine bis(dimethyldithiocarbamate] interfered with the quantitative detn. of MAA. RM

13

Arsenic and lead in an orchard environment.
Aten, C. F.; Bourke, J. B.; Martini, J. H.; Walton, J. C.
Bulletin of Environmental Contamination and Toxicology **24** (1) 108–115 (1980) [17 ref. En] [Dep. of Chem., Hobart & William Smith Coll., Geneva, New York 14456, USA]

Samples of soil, apples, grass and vegetables (radishes, carrots, onions, potatoes, tomatoes, green snap beans, cabbage, and Brussels sprouts) were taken from an apple orchard, which was started in 1929 and had been sprayed heavily with lead arsenate, and were analysed for total arsenic and Pb. Results for arsenic and Pb contents are tabulated. Results for arsenic (range and average, p.p.m.) and Pb (range and average, p.p.m.) resp. were: apple pomace, 0.015–0.080, 0.043, 1.08–9.28, 2.52; apple juice, –, <0.05, 0.037–0.085, 0.063. Concn. of arsenic and Pb (p.p.m., dry wt.) resp. in vegetable plants were: Brussels sprouts, 0.11, 1.8; cabbage leaf (inner), 0.38, 2.6; bean pod, 0.17, 2.2; tomato, 0.03, 1.4; potato, 0.02, 0.6; onion, 0.07, 0.9; carrot, 0.11, 7.5; and radish, 0.74, 15.0. In the apple juice arsenic was below the detection limit. Concn. and availability of Pb and arsenic was much smaller at depths where absorption of elements by apple roots takes place, than near the surface where the vegetable plots do not correlate well with total element concn. in the soil. Availability to plants of old As and Pb residues in loam soil is low enough that there is no particular health hazard in apples, tomatoes, beans, cabbage, Brussels sprouts, onions, and potatoes. VJG

14

Determination of arsenic by cathodic stripping voltammetry with a hanging mercury drop electrode.
Holak, W.
Analytical Chemistry **52** (13) 2189–2192 (1980) [8 ref. En] [Dep. of Health & Human Services, FDA, 850 Third Avenue, Brooklyn, New York 11232, USA]

As was determined by cathodic stripping voltammetry in an acid solution containing Se(IV). In this medium, As could be preconcentrated on the hanging mercury drop electrode and then stripped cathodically, resulting in peak current. After a deposition period of only 1.5 min, 2 ng As/ml could be detected. For developing a method of analysis for e.g. food samples, several factors had to be considered including the digestion of samples, reduction of As(V) to As(III), and the elimination of interferences. The method was used for detn. of As in NBS standard reference material orchard leaves. AL

15

[Rapid enrichment method and its use in the determination of metal traces from aqueous solutions by X-ray fluorescence.] Schnelles Anreicherungsverfahren für den Einsatz der Röntgen-Fluoreszenz-Analyse (RFA) zur Erfassung von Metallspuren aus wässrigen Lösungen.
Scheubeck, E.; Jörrens, C.; Hoffmann, H.
Zeitschrift für Analytische Chemie **303** (4) 257–264 (1980) [17 ref. De, en] [Siemens AG, Postfach 211080, D-7500 Karlsruhe 21, Federal Republic of Germany]

A rapid enrichment method is described, which allows simultaneous precipitation of several metals from aqueous solutions by diethylammonium diethyldithiocarbamate. Under special conditions the precipitate forms a thin layer on a membrane filter, which can be used for X-ray fluorescence detn. of metal traces. It was applied to drinking water, waste water and BIOKLAV decomposition solutions from beef and pork meat, liver and kidneys. 5–100 μg of Cr, Ni, Fe, Cu, Zn, Cd, Pb, Ag, Hg and Se were precipitated from 10–500 ml of water; 1–5 μg of Hg, As, Pb and Cd were precipitated from BIOKLAV decomposition solutions. Recoveries were ≥80%. Time required for one enrichment and filtration of the precipitate is 15 min for a 100 ml sample. No special equipment is needed. [From En summ.] RM

16

[Heavy metals and other toxic trace elements in the human food chain. A contribution to environmental research.] Schwermetalle und andere toxische Spurenelemente in der Nahrungskette des Menschen. Ein Diskussionsbeitrag zur Umweltforschung.
Claussen, T.
Berichte über Landwirtschaft 57 (1) 105–117 (1979) [30 ref. De, en, fr] [Umweltbundesamt, Bismarckplatz 1, 1000 Berlin 33]

In calculation of limits for toxic trace elements in gaseous emissions, danger to humans is often estimated only on the basis of uptake by inhalation. Significance of contamination of soils and uptake by food plants, and direct contamination of plants by dusts, etc., is discussed with reference to a number of elements and dose/accumulation relationships. Interactions of several toxic elements are also considered. Present and future significance of toxic trace elements is discussed. DIH

17

Arsenic in tissues of sheep and milk of dairy cows fed arsanilic acid and 3-nitro-4-hydroxyphenylarsonic acid.
Calvert, C. C.; Smith, L. W.
Journal of Animal Science 51 (2) 414–421 (1980) [18 ref. En] [USDA, Beltsville, Maryland 20705, USA]

As from 2 sources – arsanilic acid and 3-nitro-4-hydroxyphenylarsonic acid (3-nitro) – was fed to mature wethers and lactating dairy cows, and uptake and depletion of As in tissues and milk were determined. In experiments with sheep, As concn. in liver, kidney and blood increased as level of As from arsanilic acid and 3-nitro was increased in feed. Muscle As was relatively unaffected by level of arsenic in feed from either source. No statistically significant differences in As levels were observed between liver and kidney tissue, over all levels fed, or for either source of As. When comparisons were made within each tissue, As levels were significantly lower in sheep fed 3-nitro. This difference between 3-nitro and arsanilic acid within tissues was not observed in muscle or blood. Depletion rates for As were the same for all tissues, and the time required for tissue to return to pretreatment As levels was dependent on initial tissue concn. Within 6 days of removal of As from the sheep diets, 85% of the As in the liver of sheep fed arsanilic acid and 81% of the As in the liver of sheep fed 3-nitro was depleted. As levels in the kidneys of sheep fed arsanilic acid and 3-nitro were depleted by 87 and 83%, resp. In experiments with lactating dairy cows, significantly higher levels of As in milk were observed for cows fed either 3.2 or 4.8 mg As/kg of body wt. from arsanilic acid or 3-nitro. In the experiment in which 3-nitro was fed at a level of 4.8 mg/kg body wt. for 28 days, As levels plateaued after 14 days feeding and remained constant for the next 14 days. Milk As from 3-nitro returned to pre-experiment levels within 5 days after As was removed from the feed. In the experiment conducted with arsanilic acid, As feeding was stopped after 5 days and milk As levels returned to pre-experiment levels within 7 days. Because of the short duration of this study, no plateauing effect was observed. AS

18

Uptake, distribution and loss of monosodium methane arsonate by crawfish *Procambarus* sp.
Abdelghani, A. A.
Dissertation Abstracts International, B 39 (9) 4251: Order no. 79-00858, 224pp. (1979) [En] [School of Public Health & Tropical Med., Tulane Univ., New Orleans, Louisiana, USA]

Crawfish were exposed to ^{14}C-labelled monosodium methane arsonate (MSMA) at concn. of 1.1 and 11.0 µg/ml in water for 56 days, then transferred to clean water for a 56-day decontamination phase. Samples were analysed during uptake and loss phases for ^{14}C-MSMA content of gills, exoskeleton, gastrointestinal tract, hepatopancreas, abdominal muscle and whole body. Bioaccumulation during uptake was highly dependent on concn. of ^{14}C-MSMA exposure and probably on availability of binding sites for the arsenical within the crawfish. Bioaccumulation ratios at 56 days were 3.70–4.28 for hepatopancreas and 0.94–0.94 for abdominal muscle at concn. of 1.1 and 11.0 µg MSMA/ml water. Tissue loss ranges were 71–78% for gills (the highest loss rate), 48–55% for hepatopancreas, and 40% for abdominal muscle (the lowest rate of loss). Accumulation of MSMA in crawfish edible tissues (hepatopancreas and abdominal muscle) following exposure to MSMA at 1.1 and 11.0 µg/ml levels for 56 days did not pose acute or chronic health problems. Consumption of contaminated crawfish at a normal rate (3 kg/3 days) did not exceed USA FDA standards for As in meat (consumption of 36 000 kg MSMA-contaminated crawfish would be needed to result in acute toxicity). A mathematical model was developed based on the experimental results using computerized statistical tests. Uptake and loss kinetic parameters were derived using this model. AL

19

Radioanalytical determination of arsenic(III) and (V) in natural waters.
Stary, J.; Zeman, A.; Kratzer, K.; Prasilova, J.
International Journal of Environmental Analytical Chemistry 8 (1) 49–53 (1980) [6 ref. En] [Dep. of Nuclear Chem., Czech Tech. Univ., Brehova 7, Prague 1, Czechoslovakia]

A previously described radioanalytical method for detn. of As [Zeman & Prasilova, *Radiochemical and Radioanalytical Letters* (in press)] was adapted to the analysis of natural waters. A preconcentration method was developed using diethyldithiocarbamate extraction in carbon tetrachloride under acidic conditions, which increases sensitivity of the method up to 0.2 parts/billion (p.p.b.). The procedure is highly selective; none of 34 metals and 9 anions tested interfere even if present in great excess. Tap water from Prague analysed by this means in 1979 contained 0.7–1.0 p.p.b. of As (mainly in the pentavalent state, As(III) being at non-detectable levels i.e. <0.2 p.p.b.). Vltava river water (used as a source of potable water) contained 1.9–3.0 p.p.b. total As, 0.3–0.5 p.p.b. being As(III), which was oxidized only after several days to As(V). Various mineral waters from Czechoslovakia contained high levels of As, ranging from 227 $\pm$ 7 p.p.b.

of As(V) and 2.4 ± 0.2 p.p.b. of As(III) in Ida mineral water (from Beloves) to 0.4 ± 0.1 p.p.b. of As(V) and no detectable As(III) in Ondras mineral water (from Moravsky Beroun source). LH

20

Arsenic contamination in an apple orchard.
Aggett, J.; Aspell, A. C.
Environmental Pollution, A 22 (1) 39–46 (1980) [13 ref. En] [Chem. Dep., Univ. of Auckland, Private Bag, Auckland, New Zealand]

An apple orchard presumed contaminated by arsenic from an adjacent sawmill was examined. Arsenic concn. of soil, trees and fruit were determined. Detn. were carried out on skin, flesh and core sections digested in 5 M HNO_3 + 5 M H_2SO_4, and analysed by AAS. In the site nearest to the source of contamination skin, flesh and core of apples contained 4.5, 1.3 and 1.0 μg/g arsenic resp.; these levels decreased with increasing distance from the sawmill. Though these values were significantly higher than those of uncontaminated apples they were comparable with those found by Bishop & Chisholm [*Canadian Journal of Plant Science* (1966) **46**, 225–231]. The presence of arsenic in these apples does not seem to present a serious health risk, as consumption of a 150 g apple containing 1.5 μg g^{-1} arsenic would result in uptake of 225 μg arsenic i.e. about 25% of the estimated average daily intake. LH

21

[Studies on the accumulation of trace elements in fish. V. Trace elements in crustacea.]
Shimamura, Y.; Tamura, Y.; Maki, T.; Nishigaki, S.; Naoi, Y.
Annual Report of Tokyo Metropolitan Research Laboratory of Public Health 29 (1) 182–189 [17 ref. Ja] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo, 160 Japan]

Concn. of Se, Hg, arsenic, Cd, Pb, Cu, Zn, Co, Cr and Mn in 8 spp. of shrimp and 6 spp. of crab from various areas of Japan are tabulated. Hg concn. in both muscle and internal organs was generally low, <0.1 mg/kg. There was a wide variation between spp. in Se concn. of muscle, but within spp. values were fairly constant. Regional differences were observed particularly in the Hg content of snow crab, the Hg and arsenic content of kegani and Hg, Cd and arsenic contents of tiger prawn. No relationship was found between trace metal concn. and body wt. for any spp. studied. Apart from Hg, metals were found in higher concn. in internal organs than in muscle. Cd concn. in crabs tended to be higher in body than leg meat. [See preceding abstr. for part IV.] BWH

22

Determination of arsenic and mercury in biological materials by neutron activation analysis.
Maruyama, Y.; Nagaoka, Y.
Radioisotopes [Hoshasei Doigenso] 28 (5) 306–308 (1979) [5 ref. En] [Josai Univ., Keyakidai, Japan]

A simple and fast decomposition method was developed for biological materials and used for neutron activation analysis of As and Hg in short-necked clams (*Tapes philippinarum*). Tabulated results showed 18.6 p.p.m. As, 0.50 p.p.m. Hg, and 11.6 p.p.m. As, 0.20 p.p.m. Hg for samples from 2 regions, resp. RM

23

Trace metal and organochlorine pesticide residues in New Zealand farmed oysters: a preliminary survey.
Winchester, R. V.; Keating, D. L.
New Zealand Journal of Science 23 (2) 161–169 (1980) [32 ref. En] [Chem. Div., Dep. of Sci. & Ind. Res., Private Bag, Petone, New Zealand]

Oysters were collected from 8 sites in northern New Zealand and analysed for Fe, Cu, Mn, Pb, Cd, Cr, Zn, Se, Hg, As, Sb, and organochlorine pesticides including lindane, DDE and DDT, by AAS. A table of results is given for trace metal concn. in 17 samples of (i) farmed oysters (7 sites) and 5 samples of (ii) wild oysters (from 1 site). Mean Zn concn. exceeded the New Zealand Food & Drug Regulation limit of 40 μg/g by a wide margin (202 and 290 μg/g wet wt. for (i) and (ii) resp.); Cu and Cr levels were normal (mean concn. 20 and 31 μg/g and 0.23 and 0.45 μg/g, resp.); Cd occasionally exceeded the permitted level of 1 μg/g (highest concn. 20 and 46 μg/g in (i) and (ii) resp.) and requires further study; arsenic levels exceeded New Zealand regulations (mean concn. 1.95 and 1.45 μg/g), perhaps because of uptake from leached wood preservative from oyster racks, but they comply with As levels set by some other countries; Fe, Mn, Hg, Pb, Se and Sb levels complied with those of the rest of the world (mean concn. 59 and 34, 4.3 and 1.5, 0.04 and 0.02, 0.61 and 0.70, 0.15 and 0.25, and unstated). Pesticide residues were not a significant problem, being in non-detectable or trace amounts. LH

24

[Determination of arsenic in certain food products. I. Characteristics of colorimetric method.]
Brzozowska, B.
Roczniki Panstwowego Zakladu Higieny 30 (5) 441–446 (1979) [8 ref. Pl, ru, en] [Zakladu Badania Zywnosci i Przedmiotow Uzytku Panstwowego Zakladu Higieny, Warsaw, Poland]

A detailed description is given of a colorimetric method for As detn. which employs silver diethyldithiocarbamate in chloroform solution with addition of urotropin. Tests on cherry jam, mixed fruit juices, tomato concentrate and canned sardines and hake (6 samples each) showed the method to have a coeff. of variability of 3.4–10.0% (vs. 0.5–5.0% for standard solutions), a detectability of 0.2 μg As/15 ml colorimetric solution (equivalent to 0.05 mg As/kg product), a sensitivity of 0.15 μg and mean recovery rate of 88%. HBr

25

[Arsenic contamination in Manfredonia, Italy, as a result of an accident at the ANIC plant. Chemical studies on sea-foods, animals and forage.]
Palermo, D.
Archivio Veterinario Italiano 30 (3/4) 103–109 (1979) [12 ref. It] [Istituto Zooprofilattico Sperimentale della Puglia & della Basilicata, Foggia, Italy]

Studies on the arsenic concn. in a wide range of marine organisms (including edible fish, molluscs and crustacea), milk, and animals exposed to As released as a result of an accident at the ANIC plant at Manfredonia, Foggia, Italy in 1976 are described. Tables

of results are given. The results show that As concn. in tissues of animals found dead in the contaminated zone were high (e.g. 65 p.p.m. in pigs liver). Most fish from the contaminated area had As concn. no higher than those of fish from non-contaminated areas. Gradual accumulation of As was, however, observed in some molluscs (e.g. 14.40 p.p.m. (fresh wt. basis) in mussels). AJDW

26

[Aresenic contents of fruit and vegetable products.]
Brzozowska, B.
Roczniki Panstwowego Zakladu Higieny **31** (1) 57–59 (1980) [7 ref. Pl, ru, en] [Zakladu Badania Zywnosci i Przedmiotow Uzytku Panstwowego Zakladu Higieny, Warsaw, Poland]

A total of 740 samples of 8 different fruit and vegetable products (jams, juices, bean preserves, tomato concentrates) from 23 Polish provinces were analysed for As contents. 90% of the samples had As concn. ≤ 0.025 mg/kg; only 12 samples had concn. ≥ 0.1 mg/kg, and all these were below the permitted limits (0.2–1.0 mg/kg; depending on type of product). It is recommended that the max. official As levels be lowered. AS

27

[Arsenic contents of sheep's kidneys, liver and muscle, and their dependence on some endogenous and exogenous factors.] Arsengehalte in Nieren, Lebern und Muskulatur von Schafen und ihre Abhängigkeit von bestimmten endogenen und exogenen Faktoren.
Kreuzer, W.; Logdeser, E.
Fleischwirtschaft **60** (12) 2217–2224 (1980) [28 ref. De, en] [Inst. für Tierärztliche Nahrungsmittelkunde, Frankfurter Straße 92, D-6300 Gießen, Federal Republic of Germany]

Kidneys, livers and muscles from 291 sheep of various breeds and ages, from 10 locations of varying degrees of pollution in the Federal Republic of Germany, as well as kidneys and muscles from 22 UK and muscles from 22 New Zealand sheep were analysed for arsenic. Tabulated results showed highest contents in kidneys (2–118 ng/g fresh wt., mean 18.7, median 15, 95% confidence level 14–17; in UK sheep 10–30, 20.2, 21, 10–27 resp.), followed by liver (2–73, 14.6, 13, 11–14 resp.) and muscle (2–55, 13.1, 12, 11–13 resp.; UK sheep 7–42, 18.9, 17, 13–20 resp.; New Zealand sheep 2–15, 6.7, 6, 3–19 resp.). Animals from more polluted areas always had higher arsenic residues. No differences were found between sheep over or under 7 months of age or between breeds, but female sheep usually had significantly higher arsenic levels than males (means in liver 16.1 ng/g vs. 13.2, kidneys 21.5 vs. 15.8, muscle 14.1 vs. 12.3 resp.). In general, sheep muscles, livers and kidneys showed low arsenic residues and did not constitute a health hazard. Guideline values of 0.1 mg/kg fresh wt. for meat, 0.15 mg for liver and kidney are suggested. The kidneys of female animals from emission areas are suggested for control purposes; liver and muscle should be analysed if guideline values are exceeded. RM

28

[Evaluation of 3 methods for detection of arsenic.]
Rosiles M., R.
Veterinaria, Mexico 9 (1) 9–12 (1978) [9 ref. Es, en] [Dep. of Patologia. Fac. de Med. Vet. & Zootecnia, UNAM, Mexico 20 DF]

Comparative studies were conducted on 3 methods for detn. of arsenic in tissues of animals: (i) Reinschs' test, based on reaction of As^{5+} with metallic Cu and HCl to give $AsCl_3$ and Cu_3As_2; (ii) a method based on generation of AsH_3 which is then complexed with silver diethyl dithiocarbamate and determined by spectrophotometry at 520 nm; and (iii) a method based on generation of AsH_3 which is then complexed with hydrazine and determined by spectrophotometry at 750 nm. Trials were conducted on standard solutions, and on liver and kidney samples from a calf poisoned with arsenic. Results are briefly discussed. (i) is suitable only for qualitative detection. Detection limits of (ii) and (iii) are 8 and 10 p.p.m., resp. The relative merits of (ii) and (iii) are discussed; overall, (ii) is recommended. AJDW

29

Determination of arsenic by emission spectrometry using an inductively coupled plasma source and the syringe hydride technique.
Pickford, C. J.
Analyst **106** (1261) 464–467 (1981) [4 ref. En] [Environmental & Med. Sci. Div., AERE, Harwell, Oxfordshire, OX11 0RA, UK]

The syringe hydride method appears potentially attractive for As detn. using an inductively coupled plasma source. The method is easy to use for large numbers of samples, and accuracy seemed satisfactory for the materials tested (Bowen's kale, cabbage 456-1, etc.). AL

30

Determination of total inorganic arsenic in fish, shellfish and fish products.
Brooke, P. J.; Evans, W. H.
Analyst **106** (1262) 514–520 (1981) [10 ref. En] [Dep. of Ind., Lab. of the Gov. Chem., Cornwall House, Stamford Street, London, SE1 9NQ, UK]

2 methods are described for detn. of total inorganic As in fish, shellfish and fish products. Method 1 involves separation of the inorganic As by distilling it from 6.6N HCl. Method 2, a more laborious method, involves chelation and extraction of inorganic As after sample dissolution in NaOH solution, with subsequent back-extraction and oxidation. In both methods the As concn. is measured, after hydride generation by AAS with atomization in a flame-heated silica tube: with method 1 the solution contains As(III), and in method 2 the solution contains As(V). Results obtained by both methods are in agreement over a range of samples. The distillation method is favoured for reasons of efficiency and economy in time. Levels of total inorganic As in the various fish spp. tested did not exceed 0.10 mg/kg. Expressed as a % of total As present, the inorganic As varied from <1 to 5%. AL

31

Tissue retention of arsenic in rats fed witch flounder or cacodylic acid.

Siewicki, T. C.

Journal of Nutrition **111** (4) 602–609 (1981) [21 ref. En] [Charleston Lab., Nat. Oceanic & Atmospheric Admin., PO Box 12607, Charleston, S. Carolina 29412, USA]

Witch flounder (*Glyptocephalus cynoglossus*) and winter flounder (*Pseudopleuronectes americanus*) containing 115 and 18.8 p.p.m. arsenic in their tissues, resp., were used to make (i) high (28.8 p.p.m.), (ii) medium (15.8 p.p.m.), and (iii) low (4.7 p.p.m.) level arsenic diets for feeding to weanling male Sprague-Dawley rats in restricted (90% of ad lib.) or ad lib. fashion. Cacodylic acid was also fed at medium and high levels. Dietary arsenic caused liver and spleen of (i) to increase by 7 × and 2 × resp. compared to controls, i.e. liver levels in ad lib. fed rats were 12.5 p.p.m. in (i) and 1.8 p.p.m. in (iii), and spleen levels were 5.2 p.p.m. in (i) and 2.6 p.p.m. in (iii). Cacodylic acid retention patterns were much more exaggerated. These results indicate that dietary arsenic derived from fish may be less hazardous to consumers than that in forms commonly used for metabolic studies. Further work is needed. LH

32

[Contents of heavy metals in foods produced in Hokkaido.]

Sato, C.; Yamamoto, I.; Osanaga, H.; Sato, Y.

Report of the Hokkaido Institute of Public Health [Hokkaidoritsu Eisei Kenkyusho Ho] No. 30, 87–88 (1980) [Ja]

Contents of As, Pb, Cd, Cu, Zn, and Mn are tabulated for wheat, azuki beans, potato, burdock, radish leaves and root, spinach, chinese cabbage, pumpkin, cucumber, tomato, strawberries, apples, pears, grapes, shiitake mushrooms, nameko and konbu (172 samples) produced in Hokkaido. BWH

33

Metal content of shark muscle powder biological reference material.

Taguchi, M.; Takagi, H.; Iwashima, K.; Yamagata, N.

Journal of the Association of Official Analytical Chemists 64 (2) 260–264 (1981) [19 ref. En] [Inst. of Public Health, Dep. of Radiological Health, Shirokanedai 4-6-1, Minato-ku, Tokyo, 108, Japan]

Powdered dried shark muscle (*Cephaloscyllium umbratile*) is a promising biological reference material for metal analysis. Homogeneity indices (coeff. of variation %) for Na, K, Zn, As, Ca, and Hg of the shark powder were within 5%. Mercury and arsenic concn. (total Hg, 9.1 p.p.m. dry wt., As, 99 p.p.m. dry wt.) in shark powder are relatively high. Muscle can be obtained inexpensively, and the powder can be preserved indefinitely if kept cold. AS

34

Extraction and spectrophotometric determination of arsenic in the environment.

Agrawal, Y. K.; Patke, S. K.

International Journal of Environmental Analytical Chemistry 8 (3) 157–162 (1980) [9 ref. En] [Analytical Lab., MS Univ. of Baroda, Kalabhavan, Baroda 390 001, India]

A method for arsenic detn. in environmental samples is described. Arsenic forms a yellow complex with *N*-phenylbenzohydroxamic acid at pH 4.5–5.2, which can be extracted and determined by spectrophotometry at 410 nm. The concn. of arsenic in various samples, including cabbage and apple, was determined by this method, and compared to standard values obtained by AAS. Cabbage contained 2.5–5.0 p.p.m. arsenic, and apple 1.5–3.0 p.p.m. by both methods, so the new procedure is deemed reliable. LH

35

Determination of arsenic in urine and feces by dry ashing, atomic absorption spectrometry.

Tam, G. K. H.; Lacroix, G.

International Journal of Environmental Analytical Chemistry 8 (4) 283–290 (1980) [16 ref. En] [Food Res. Div., Health & Welfare Canada, Tunney's Pasture, Ottawa, Ontario, Canada K1A 0L2]

A dry ashing flameless AAS procedure is described for detn. of arsenic in different biological samples. Results are quoted for the urine and faeces of human volunteers who ingested a meal of fish containing high natural arsenic levels (approx. 50 p.p.m.), and recovery was 85–117%, with s.d. of 10%. Fish arsenic compounds were completely absorbed and rapidly excreted in urine, but very minimally in faeces. This procedure was also found reliable for detn. of arsenic in a wide range of food products, i.e. apple juice, wine, fish, meat, and vegetables (recovery 80–120%). Several freeze dried marine samples were analysed by this new method and the traditional colorimetric method resp., and results were (p.p.m.): cod 7.03–7.31 and 7.0–7.1, shrimp 42.74–43.36 and 44.5–47.5, and flounder 283.3–287.4 and 254.0–268.0. LH

36

[The agricultural significance of heavy metals.] Die pflanzenbauliche Bedeutung von Schwermetallen.

Kampe, W.

Verbraucherdienst 25 (12) 267–272 (1980) [1 ref. De] [Landwirtschaftliche Untersuchungs- & Forschungsanstalt, Speyer, Federal Republic of Germany]

Aspects discussed include: the present situation in relation to heavy metals in foods; toxicity of heavy metals; dietary requirement for low concn. of some heavy metals; sources of contamination (with reference to heavy metal concn. in the soil, air and sewage sludge, proprietary fertilizers, and pesticides); differences in heavy metal uptake between different plants and different spp. of edible fungi; practical implications; and the potential for reduction of heavy metal concn. occurring in foods. AJDW

37

Analysis of trace metals in orange juice. [Lecture]
McHard, J. A.; Foulk, S. J.; Jorgensen, J. L.; Bayer, S.; Winefordner, J. D.
ACS Symposium Series 143, 363–392 (1980) [70 ref. En] [Dep. of Chem., Univ. of Florida, Gainesville, Florida 32611, USA]

Methods for detn. of mineral elements in orange juice are presented together with some comparative data showing the similarities and differences which occur especially between orange juices from Florida and Brazil. Some statistical representations are given to show how these differences may be used as finger-prints of geographical origin of the juices. [See FSTA (1981) 13 11J1587.] AL

38

[Effect of soil arsenic at various applied P levels, on yield and arsenic content of some farm crops.]
Toth, J.
Pol'nohospodarstvo 26 (3) 210–218 (1980) [15 ref. Sk, en, ru] [Katedra Chemie, Vysoka Skola Pol'nohospodarska, 949 67 Nitra, Czechoslovakia]

Barley and maize were grown in pot culture in soil with NPK mixture added at 1, 2.5 or 5 g P_2O_5/pot without added As or with As added in ash at 25 or 50 mg/pot. Arsenic content increased in barley grain and in maize ripe for ensiling with increase in As addition to soil, but was not influenced by level of P fertilization. SKK

39

[Gel-filtration profile of the arsenic compounds in water extracts of seaweeds.]
Adachi, S.; Kawai, H.; Hosogai, Y.
Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] 21 (1) 13–17 (1980) [9 ref. Ja, en] [Food Hygiene, Kagawa Nutr. Coll., 24-3, Komagome 3-chome, Toshima-ku, Tokyo, Japan]

Brown algae contain more arsenic (22.7–138.3 p.p.m.) than other seaweeds, and the arsenic compounds can be extracted using distilled water. Arsenic compounds from several brown algae, i.e. (i) Hijiki, *Hizikia fusiforme*, (ii) Makonbu, *Laminaria japonica*, (iii) Matsumo, *Heterochrodaria abientina*, (iv) Wakame, *Undaria pinnatifida*, and (iv) Awabi, *Halotis gigantea* were studied by gel-filtration and arsenic determined by flameless AAS. Elution vol. are quoted for each seaweed peak, (i) 200 ml, (ii) 170 ml, (iii) 165 and 190 ml, (iv) 170 ml and (v) 200 ml. The fractions of (i) were examined by ninhydrin reaction and slight coloration was observed. [From En summ.] LH

40

[The chemical form of arsenic in marine algae.]
Kaise, T.; Watanabe, S.; Ikeda, H.
Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] 21 (1) 58–63 (1980) [15 ref. Ja, en] [Kanagawa Prefectural Public Health Lab., 52-2, Nakao-cho, Asahi-ku, Yokohama, Japan]

Hijiki (*Hizikia fusiforme*) contains a large amount of arsenic compounds, corresponding to about 100–180 p.p.m. as As_2O_3 in dry samples. 25% of the arsenic in Hijiki was readily soluble in water, the remainder was fat-soluble or conjugated with tissue components. The water-soluble arsenic was also soluble in methanol and ethanol, and seemed to consist of low mol. wt. organic compounds, based on the results of gel permeation chromatography and ultrafiltration. 75% of this material was adsorbed on weak cationic exchange resin (Dowex CCR-2); it could be eluted with 0.01N HCl and yielded white tetrahedral crystals, having weak UV absorption at 279 nm. HPLC analysis of this material showed that the pattern of absorbance at 279 nm in the eluate essentially coincided with that of arsenic concn. This material, which is a major component of the arsenic-containing compounds in Hijiki, thus appears to be an organo-arsenic compound. AS

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ommonwealth Agricultural Bureaux, Farnham Royal, Slough; Gesellschaft fur Information und okumentation, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor andbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen

INTRODUCTION

Food Annotated Bibliographies (FABs) are collections of abstracts on specific topics in food science and technology. The topics are chosen by the staff of the International Food Information Service as being of particular interest or importance. The topics normally interest individual workers, who may not require the full information provided in Food Science and Technology Abstracts, from which the abstracts for FABs are taken. The size and the cost of the FABs are controlled as much as possible with the interests of individual workers in mind.

Titles of the FABs now available are given on the back cover of this booklet. For up-to-date lists of FABs or suggestions for new topics please write to the address on the back cover. New subjects are searched for at least the five most recent volumes of Food Science and Technology Abstracts. Thereafter each FAB is updated monthly. Copies of each months abstracts on any topic may be obtained as indicated on the back cover of this publication. At the end of each volume of up-dating, the abstracts are merged and made available as a separate supplement to the original FAB.

Some of the larger FABs have been divided into sections to facilitate use. FAB 47 also has a subject and author index provided.

Copies of all original articles referred to in the abstracts may be bought (or occasionally borrowed) from the International Food Information Service. A form for ordering these is provided at the end of this FAB.

Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would, in any case, encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES

EDITOR

1

The determination of arsenic at ng/g and μg/g levels in organic and biological matrices.
Raptis, S. E.; Wegscheider, W.; Knapp, G.
Mikrochimica Acta 1 (1/2) 93–97 (1981) [6 ref. En, de]
[Inst. für Analytische Chem., Technikerstrasse 4, A-8010 Graz, Austria]

3 independent decomposition methods for organic matter were compared for use in the detn. of As by the hydride-AAS method. Tabulated results for NBS orchard leaves, tomato leaves, rice flour (NBS 1568) and fish solubles (IAEA No. A-6/1975) show that matrix interferences in AsH_3 evolution cause systematic errors. RM

2

A study on the neoasozine residues in rice grain by neutron activation method.
Kim, Y. H.; Lee, K. J.; Lee, S. R.
Korean Journal of Food Science and Technology 13 (1) 20–24 (1981) [9 ref. En, ko] [Environmental Chem. Lab., Korea Atomic Energy Res. Inst., Seoul 131, S. Korea]

Neoasozine (NE), an organoarsenic fungicide (the ferric ammonium salt of methyl arsenate), was sprayed in liquid formulation at 6.5% and a dose of 1.3 kg/ha on to paddy rice cv. Milyang 24 in July and Aug., (i) twice or (ii) a total of 4 times. Rice grains were collected and dehulled prior to analysis for arsenic residues by neutron activation and colorimetry. Arsenic residues in brown rice (as mg As_2O_3/kg) were 0.137 ± 0.040 in the control, 0.157 ± 0.028 in (i), and 0.543 ± 0.016 in (ii), as measured by neutron activation, vs. <0.10, <0.10, and 0.747 ± 0.037 as measured by colorimetry. Tentative Korean government limits for As_2O_3 in brown rice are set at 3.5 p.p.m. so these levels are acceptable, although (i) is preferred. The partitioning of arsenic residues during rice polishing and oil extraction from the bran was estimated; rice bran contained 2.338 mg As_2O_3/kg (the highest concn.), in (ii) vs. 0.803 in the control, most of this residue remaining in the oil cake on oil extraction (0.133 mg/kg left in the oil). LH

3

[Distribution of arsenic in some fishes.]
Kobayashi, R.; Shiomi, K.; Yamanaka, H.; Kikuchi, T.
Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 46 (10) 1265–1268 (1980) [14 ref. Ja, en] [Lab. of Food Hygienic Chem., Tokyo Univ. of Fisheries, Konan, Minato-ku, Tokyo 108, Japan]

As contents were determined in tissues and muscle of monkfish (*Kathetostoma giganteum*), English hake (*Merluccius australis*) and Hoki (*Macruronus novaezelandidae*). Tissues examined included liver, kidney, spleen, stomach, intestine, gall bladder, heart and gills, and the muscles were divided into 14–16 sections to investigate the distribution of As. In monkfish As contents were higher in muscle (5.6–25.4 p.p.m.) than in the other tissues, and the As concn. in the dorsal muscle was about twice that in the ventral muscle. Much less As was found in English hake and little difference was found amongst the tissues and muscle. Hoki contained more As in the tissues than in muscle; concn. were 13.4 and 14.6 p.p.m. in liver and gall-bladder, resp. In the muscle, 61–96% of total As was found in the fraction extracted with 5% perchloric acid; 3 other fractions, water-soluble protein, salt-soluble protein and fat fractions shared the rest. In contrast, the liver of Hoki contained as high as 38% As in the fat fraction, although the fraction extracted with perchloric acid contained the largest (56%). No correlation was observed between body wt. of monkfish and As concn. AS

4

[Study of the arsenic content in ground waters.]
Khorvat, A.
Gigiena i Sanitariya No. 6, 63–65 (1980) [11 ref. Ru]
[Gosudarstvennyi Inst. Gigieny, Budapest, Hungary]

In connection with an outbreak of As poisoning in a region of Hungary, the As content of ground water from various geographical locations in this region was studied. Concn. as high as 1.06 mg/l were found, concn. varying according to location. Epidemiological aspects of the results are discussed. RAW

5

[Seasonal variation in heavy metal content of the edible portion of short-neck clam, *Tapes japonica*.]
Kumagai, H.; Saeki, K.
Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 46 (7) 851–854 (1980) [17 ref. Ja, en] [Yamaguchi Prefectural Res. Inst. of Health, Aoi, Yamaguchi City 753, Japan]

In order to elucidate seasonal variation in heavy metal content of benthos [bottom flora and fauna] inhabiting the shallow waters unaffected with industrial waste disposal, total Hg, Se, Zn, As, Cu, Co, Cd, Cr, Pb, Mn and Ni were determined in the edible portion of short-neck clam obtained at Aio-cho in Yamaguchi Prefecture during 1977–1979. A seasonal variation with a max. in winter was found in levels of Hg, Co, Cd, Cr, Pb, Mn and Ni, whereas seasonal consistency was observed in the levels of Se, Zn, As and Cu. AS

6

[Content of metals in meat additives.]
Polic, M.; Djulic, I.; Bastic, L.
Tehnologija Mesa 21 (9) 253–255 (1980) [11 ref. Sh, en]
[Jugoslovenski Inst. za Tehnologiju Mesa, Belgrade, Yugoslavia]

Studies were conducted to determine concn. of essential metallic elements (Fe, Ca, Mg, Na, K, Mn, Cu, Co, Zn) and toxic metals (Pb, As, Sb, Hg, and Cd) in curing brine, various protein preparations, spices, monosodium glutamate, smoke concentrates and glucono-δ-lactone. Tables of data are given for concn. of metals in these additives. STI

7

[Arsenic contents in liver, kidneys and meat of normally fed fattening pigs.] Arsengehalte in Lebern, Nieren und Fleisch von Mastschweinen bei normaler Fütterungsweise.
Crössmann, G.
Archiv für Lebensmittelhygiene 32 (3) 87–89 (1981) [8 ref. De, en] [Landw. Untersuchungs- & Forschungsanstalt, 4400 Münster, Federal Republic of Germany]

400 fattening pigs were fed for 6–7 months with 16 commercial and experimental complete feeds, As contents 0.10–0.65 mg/kg in DM. Tabulated results showed mean As contents of 6–105 (mean 37) parts/billion (fresh wt. basis) in the kidneys, 9–79 (mean 26) in the liver. No As was detected in the meat or fat (detection limit 5 parts/billion). RM

8

Non-alcoholic carbonated beverages. Determination of arsenic and lead contents.
Oman, Ministry of Commerce & Industry
Omanian Standard OS 30/1980, 5 + 7pp. (1980) [En, Ar]

Reagents, apparatus, and procedures are given for detn. of As and Pb in non-alcoholic carbonated beverages. AL

9

[Determination of arsenic in certain food products. II. Arsenic content of fish and of fish, fruit and vegetable products.]
Brzozowska, B.
Roczniki Panstwowego Zakladu Higieny 31 (5) 461–463 (1980) [12 ref. Pl, ru, en] [Panstwowy Zaklad Higieny, 00-791 Warsaw, Poland]

Arsenic content determined by the method described in part I [FSTA (1981) 13 7A439] ranged in 8 species of sea and fresh-water fish from 0.12 mg/kg in roach to 1.45 mg/kg in cod; the range for 6 canned fish products (cod, hake, sardine or herring) was 0.38–0.87 mg/kg; and for 11 canned vegetables, fruit nectars, juices and jams and tomato juice and concentrate, the range was 0.05–0.10 mg/kg. The suggestion made in FSTA (1981) 13 7J1040 that max. official As levels for fruit and vegetable products be lowered is repeated. SKK

10

A survey of heavy metals in the surf clam, *Spisula solidissima*, and the ocean quahog, *Arctica islandica*, of the mid-Atlantic coast of the United States.
Wenzloff, D. R.; Greig, R. A.; Merrill, A. S.; Ropes, J. W.
Fishery Bulletin, National Oceanic and Atmospheric Administration 77 (1) 280–285 (1979) [16 ref. En] [Northeast Fisheries Cent. Milford Lab., Nat. Marine Fisheries Service, NOAA, Milford, Connecticut 06460, USA]

Heavy metals (Ag, As, Cd, Cu, Zn, Cr, Hg, Ni, and Pb) were determined in (i) surf clams and (ii) ocean quahogs from 151 locations. Concn. of Cd, Cu, Pb, and Zn in both spp. were well below recommended max. concn., but the limit of 1.14 p.p.m. As was exceeded at all but a few sampling stations, overall mean being 2.1 p.p.m. for (i) and 3.0 p.p.m. for (ii). Hg concn. were well below FDA action limits. Average concn. of Ag, As, Cd, Cu and Zn were higher in (ii) than in (i) for the entire survey. JRR

11

[Arsenic determination in the soil and in mains water.] Bestimmung von Arsen im Boden und im Wasser von Zisternen.
Costantini, S.; Giordano, R.; Ravagnan, P.
Annali dell'Istituto Superiore di Sanita 16 (2) 287–294 (1980) [8 ref. It, en] [Istituto Superiore di Sanita, Rome, Italy]

A method is described for detn. of As^{5+}, based on AAS, using a Perkin Elmer 603 atomic absorption spectrophotometer and a Perkin Elmer HGA 76 graphite oven. Water samples are treated with HNO_3 before AAS, to convert all As to As^{5+}. IN

12

Determination of total arsenic in biological samples by arsine generation and atomic absorption spectrometry.
Uthus, E. O.; Collings, M. E.; Cornatzer, W. E.; Nielsen, F. H.
Analytical Chemistry 53 (14) 2221–2224 (1981) [9 ref. En] [Grand Forks Human Nutr. Res. Cent., USDA, PO Box 7166, University Sta., Grand Forks, N. Dakota 58202, USA]

Arsine generated from dry combusted biological samples was measured using an atomic absorption spectrophotometer equipped with a graphite furnace. Modifications to the method enabled sensitivity and absolute detection limits of 0.11 ng and 0.14 ng, resp., to be obtained. As content was determined in various NBS standard reference materials (e.g. bovine liver, orchard leaves, oyster tissue) and values agreed with the certified values. AL

13

[Quantitative determination of As, Pb, Cd, Hg and Se in foods by flameless AAS.] Quantitative Bestimmung von Arsen, Blei, Cadmium, Quecksilber und Selen in Lebensmitteln mit Hilfe flammenloser Atom-Absorptions- Spektrophotometrie.
Müller, H.; Siepe, V.
Deutsche Lebensmittel-Rundschau 77 (11) 392–400 (1981) [6 ref. De, en, fr] [Consumer Res. & Development, Knorrstrasse 1, D-7100 Heilbronn, Neckar, Federal Republic of Germany]

A device developed for wet-ashing of food samples for subsequent analysis by AAS is described in detail; results of recovery studies on various foods are given. Ranges of values for % recoveries were: As 84–98; Cd 92–110; Hg 69–82; Pb 73–94; and Se 85–107.

A procedure for AAS detn. of these elements after extraction as diethylammonium diethyldithiocarbamate derivatives is described in detail; specific AAS conditions for As, Pb, Cd, Hg and Se are given. Detection limits were (parts/billion): As 3; Pb 4; Cd 2; Hg 2–3; and Se 15. This method was used for detn. of As, Cd, Hg, Pb and Se in a wide range of foods; a table of results is given. AJDW

14

[Drinking water. Determination of arsenic content.]
Bulgaria, D"rzhaven Komitet za Standartizatsiya
Bulgarian Standard BDS 3570-79, 6pp. (1980) [Bg]

This standard, which supersedes BDS 3570-70, describes a photometric method for detn. of inorganic forms of As in the 0.001–0.010 range

15

Metal contamination of food. [Book]
Reilly, C.
xvi + 235pp. ISBN 0-85334-905-3 (1980) [many ref. En] Barking, Essex, UK; Applied Science Publishers Ltd. Price £17.00 [Queensland Inst. of Tech., Brisbane, Australia]

This book provides a discussion of the part played by metals in human nutrition and health, and their content in foods. Chapters are: A peck of dirt (pp. 3–14, 12 ref.); How metals get into food (pp. 15–45, 63 ref.); Quality control (pp. 46–63, 19 ref.); Food quality – analysis of food (pp. 64–82, 23 ref.); Lead (pp. 85–104, 52 ref.); Mercury and cadmium (pp. 105–122, 48 ref.); The toxic metalloids: arsenic, antimony and selenium (pp. 123–137, 63 ref.); The packaging metals: aluminium and tin (pp. 138–147, 30 ref.); Transition metals (pp. 148–183, 91 ref.); Other transition metals (pp. 184–189, 15 ref.); Zinc – the unassuming nutrient (pp. 190–196, 21 ref.); Beryllium, strontium, barium and the other metals – summing up (pp. 197–209, 43 ref.). A 9-pp. subject index is included. LH

16

[Contents of heavy metals in foods produced in Hokkaido. IV. Contents of heavy metals [As, Pb, Cd, Zn, Mn, Hg] in fishes and shellfishes.]
Yamamoto, I.; Osanaga, H.; Sato, Y.; Sato, C.
Report of the Hokkaido Institute of Public Health [Hokkaidoritsu Eisei Kenkyusho Ho] No. 30, 31–37 (1980) [14 ref. Ja]

In Sept. 1978 and 1979 162 samples of 43 fish spp. were taken from fish markets in Hokkaido. High levels of As were found in chub, dace, 'kurogarei', Pacific cod and slime flounder (*Microstomus achne*), with mean values 40.60, 28.59, 8.43, 8.38 and 7.23 p.p.m. resp. Other fish contained As at 0.24–3.67 p.p.m. Pb was only found at low levels, 96.9% contained <0.04 p.p.m.; the highest Pb content was in 1 sample of cuttlefish 0.17 p.p.m. Scallops, squid and chub contained on average 0.238, 0.205 and 0.049 p.p.m., more than flat fish and 'soi' fish; 0.76 p.p.m. was found in 1 sample of squid. Most samples contained <1 p.p.m. Ca but chub, octopus and squid averaged 3.11–10.83 p.p.m. Levels of Zn ranged from 5–20 times those of Cu, Zn content of 'chika', scallop and squid ranged between 10 and 22 p.p.m.; single samples of octopus and cod roe contained 32.4 and 38.8 p.p.m. resp. Highest levels of Mn were in scallops, 1.06–1.20 p.p.m.; 'sunagarei', scallops, sandfish (*Actoscopus japonicus*) and 'hakki' averaged 0.26–0.51 p.p.m. No fish contained more than the provisional legal limit of Hg (0.4 p.p.m.); the highest level was 0.309 in 1 sample of rock trout (*Hexagrammos otakii*). Highest average levels were in horse mackerel, halibut and rock trout, 0.241, 0.157 and 0.143 p.p.m. In rocktrout, bullhead (*Cottus pollux*), flat fish, mackerel and 'soi' fish there was a positive relationship between body wt. and Hg content. In flat fish there were positive relationships between Hg and As and between As and Zn contents. [See FSTA (1981) 13 10C346 for Part III.] CIH

17

Determination of arsenic and selenium in water, fish, and sediments by inductively coupled argon plasma emission spectrometry.
Goulden, P. D.; Anthony, D. H. J.; Austen, K. D.
Analytical Chemistry 53 (13) 2027–2029 (1981) [4 ref. En] [Nat. Water Res. Inst., Canada Cent. for Inland Waters, Burlington, Ontario, Canada]

A semi-automated system for detn. of As and Se by hydride generation is described, using atomic emission spectrometry with inductively coupled argon plasma excitation (ICAP). Diagrams are given of the manifold used for automated hydride generation and of the ICAP system. The 'torch' used for ICAP application was increased from 17 mm to 19 mm internal diam. Fish are digested with nitric, perchloric and sulphuric acids. Values of 0.1 μg/l can be reliably reported for both As and Se in water; soil samples gave 1.3–6.5 μg/g for As and 0.08–0.93 for Se. Results obtained for typical natural waters and fish samples showed no significant differences from results obtained by a hydride generation atomic absorption technique. ELC

18

[Arsenic in sea fish, crustacea and cephalopoda.]
Arsen in Seefischen, Krebsen und Kopffüssern.
Petrovic, I.; Katalenic, M.
Hrana i Ishrana 22 (5/6) 115–118 (1981) [11 ref. Sh, en] [Zavod za Zastitu Zdravlja SR Hrvatske, Zagreb, Yugoslavia]

As contents were determined in 36 samples of (i) dark-fleshed fish (mackerel, tuna, sardine, anchovy), 83 samples of (ii) white fish of 10 types, 46 samples of (iii) cephalopods (cuttlefish, squid, octopus), and 19 samples of (iv) crustacea (scampi, shrimps). Mean values and ranges (mg/kg) were: (i) 0.64 and 0.1–2.54; (ii) 1.15 and 0.1–12.51; (iii) 1.69 and 0.15–7.89; and (iv) 3.33 and 0.38–14.06. The highest As concn. were recorded in scampi *(Nephrops norvegicus)*, conger eel *(Conger conger)* and octopus *(Octopus vulgaris)*. AJDW

19

Determination of arsenic in biological, environmental and geological materials by arsine evolution-flameless atomic absorption spectrophotometry.
Yanagi, K.; Ambe, M.
Japan Analyst [Bunseki Kagaku] 30 (4) 209–214 (1981) [En] [Sagami Chem. Res. Cent., 4-4-1, Nishi Ohnuma, Sagamihara-shi, Kanagawa, Japan]

4 different methods of digestion were examined for use in detn. of As by the method of arsine evolution-flameless AAS. Analysis of 11 reference samples including fish and shellfish (oysters) showed that results of Kjeldahl digestion with flameless AAS agreed well with certified National Bureau of Standards (NBS) values. RM

20

Heavy metals in foods.

Dewdney, P. A.; King, C. F.

Food Legislation Surveys, Leatherhead Food RA No. 6, 49pp. (1980) [En] [Price Members £5.00 Non-members £15.00 [Leatherhead Food RA, Randalls Road, Leatherhead, Surrey, UK]

A survey is presented of worldwide legislation on the max. levels of heavy metals which are permitted in food and beverages. A guide to the countries which have legislation on permissible levels of arsenic, Cu, Fe, Pb, Hg, Sn and Zn is given in tabular form. Food products and max. levels of heavy metals in them are listed under each country. The countries have been arranged alphabetically under various areas of the world: Europe — EEC countries (Belgium, Denmark, Eire, France, Italy, Luxembourg, Netherlands, UK, West Germany); Europe — Non-EEC countries (Austria, Finland, Malta, Norway, Portugal, Spain, Sweden, Switzerland, Yugoslavia); North America — Canada, USA, South America and Caribbean (Argentina, Brazil, Colombia, Guyana, Jamaica, Trinidad and Tobago, Uruguay); Australasia (Australia, Fiji, New Zealand, Papua New Guinea); Africa (Kenya, Mauritius, Namibia, South Africa, Zambia); Asia (Bangladesh, Hong Kong, India, Japan, Pakistan, Sabah and Sarawak, Singapore, Thailand); and Middle East (Iraq, Israel, Kuwait, Saudi Arabia). Tabulated data give max. levels for As, Cu, Pb and Zn resp. in various foods and beverages for 17 of the countries. A table also presents the max. levels recommended for metal contaminants by the joint FAO/WHO Codex Alimentarius Commission. VJG

21

Effects of arsenic sprays on different citrus fruit juice acidity.

Procopiou, J.; Wallace, A.

Alexandria Journal of Agricultural Research 27 (1) 93-98 (1979) [27 ref. En, ar] [Min. of Agric. Res. Service, Athens, Greece]

Summer sprays of some As compounds were tried on some citrus var. at the Univ. of California, Los Angeles to determine if acid concn. of fruit could be reduced. Potassium arsenate, sodium arsenite, and arsenic trioxide were effective in lowering citrus fruit acidity during the short period of study. Lead and calcium arsenate sprays were effective only in some cases at higher concn. Associated leaf fall from the sprays may have reduced fruit size. AS

22

[A procedure for ashing of organic materials with oxygen under pressure.] Über ein Verfahren zum Aufschluss organischen Materials mit Sauerstoff unter erhöhtem Druck.

Weber, O.; Beil, E.

Deutsche Lebensmittel-Rundschau 77 (10) 361-363 (1981) [5 ref. De, en, fr] [Chem. Untersuchungsanstalt der Stadt Nürnberg, Hauptmarkt 1, 8500 Nürnberg, Federal Republic of Germany]

The Bioklav device for ashing of organic materials (including foods and food contact items) in O_2 at a pressure of 35 bar is briefly described. Experience with this device confirms that this device gives very low losses of relatively volatile elements such as Hg, As or Se. Further advantages include the use of HCl alone for dissolving the residue, and the rapidity of the technique. The sample should comprise $\leq$5-6 g solids, to avoid excess pressure developing in the device; efficient cooling is also required. The inside of the apparatus must be thoroughly cleaned after use, as the condensate is included in the material subsequently analysed. Although adjustment of samples to approx. 20% moisture before ashing is recommended, some foods with higher moisture contents gave good results without adjustment of moisture content, comminution being necessary in some cases. A table is given in which foods are classified into foods suitable for direct ashing, and those for which moistening or drying is desirable. AJDW

23

Determination of arsenic and antimony in water and soil by hydride generation and atomic absorption spectroscopy.

Haring, B. J. A.; Delft, W. van; Bom, C. M.

Zeitschrift für Analytische Chemie 310 (3/4) 217-223 (1982) [9 ref. En, de] [Nat. Inst. for Water Supply, PO Box 150, NL-2260 AD Leidschendam, Netherlands]

A colorimetric field method for the detn. of As and Sb was compared with atomic absorption (AA) techniques using both graphite furnace AA and the hydride generating technique with the heated quartz cell. Compared with the colorimetric technique, the AA hydride technique with the heated quartz cell was found to suffer from interferences by other hydride-forming elements (Se, Bi, Sn). Slow addition of $NaBH_4$ (5 min in the case of the colorimetric method) results in a longer reaction time giving complete transformation of the hydride forming elements. The work also includes the optimization of various analytical parameters with respect to the hydride technique. Tabulated data include results for surface water, sea water and drinking water. AS

24

Determination of heavy metals in a menhaden oil after refining and hydrogenation using several analytical methods.

Elson, C. M.; Bem, E. M.; Ackman, R. G.

Journal of the American Oil Chemists' Society 58 (12) 1024-1026 (1981) [15 ref. En] [Dep. of Chem., Saint Mary's Univ., Halifax, Nova Scotia, Canada B3H 3C3.]

A series of menhaden oils (crude, degummed, degummed + gums, refined, refined and bleached, hydrogenated and filtered, hydrogenated, filtered and bleached, and hydrogenated, filtered, bleached and deodorized), collected at various stages of processing were analysed for Zn, Cd, Pb, Cu and As by wet digestion and electrothermal atomization-AAS. The results are compared, for some metals, with 2 other methods of oil treatment: extraction with HNO_3, and

dilution with methyl isobutyl ketone. Both the extraction and dilution procedures appeared to measure only the loosely bound, inorganic portion of the metals: detn. of the total metal content including organometallics required wet digestion. The crude oil contained the largest metal burden but successive refining steps reduced the metal content to a level which met the FAO/WHO Codex standards. Hydrogenation did not significantly alter the metal concn. in the oils. AS

25

Trace determination of As(III) and As(V) in natural waters by differential pulse anodic stripping voltammetric.
Bodewig, F. G.; Valenta, P.; Nürnberg, H. W.
Zeitschrift für Analytische Chemie **311** (3) 187–191 (1982) [20 ref. En, de] [Chem. Dep., Nuclear Res. Cent., PO Box 1913, D-5170 Jülich, Federal Republic of Germany]

A method is described for detn. of As in natural and drinking water by differential pulse anodic stripping voltammetry. For a 4 min deposition time the detn. limit is about 0.2 μg/l. Relative s.d. for 2–4 μg As/l is 6–10%. The method is sensitive and fast, with total time for complete analysis about 30 min for a deaerated sample, or 75 min for total As detn. (including reduction of As^{5+}), and is suitable for drinking water control. RM

26

[Separation of toxic heavy metals from solutions by means of chelating cellulose exchangers.]
Abtrennung von toxischen Schwermetallen aus Lösungen mit chelatbildenden Celluloseaustauschern.
Goldbach, K.; Lieser, K. H.
Zeitschrift für Analytische Chemie **311** (3) 183–186 (1982) [14 ref. De, en] [Tech. Hochschule Darmstadt, Hochschulstrasse 4, D-6100 Darmstadt, Federal Republic of Germany]

Separation of trace elements (Hg, Cd, As, Mo, Cr) on 3 cellulose exchangers with chelating anchor groups is described. Enrichment of these trace elements from drinking water facilitates control of max. legally-permitted concn. DIH

27

[Distribution of trace amounts of heavy metals in short-necked clam and sludge in Tokyo Bay (1978–1979).]
Horii, S.; Yamagishi, T.; Miyazaki, T.; Kaneko, S.; Murakami, H.
Annual Report of Tokyo Metropolitan Research Laboratory of Public Health **31** (1) 156–160 (1980) [6 ref. Ja] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo, 160 Japan]

Short-necked clams were sampled at a number of locations in Tokyo bay in 1978 and 1979 and analysed for contents of 7 heavy metals. Results are tabulated for each location. Overall means for both yr (53 samples), with s.d. (p.p.m., wet basis), are as follows: Pb 0.13 ± 0.11; Co 0.14 ± 0.05; Zn 23 ± 5; Cd 0.04 ± 0.02; Cu 1.1 ± 0.3; Hg 0.104 ± 0.050; As 1.52 ± 0.48. Correlation coeff. between heavy metal concn. are tabulated, as are corresponding data on Tokyo bay sludge. [From En tables.] DIH

28

[Distribution of arsenic in the frond of some kombu, *Laminariaceae* algae.]
Kumagai, M.; Fukushima, Y.
Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] **47** (2) 251–254 (1981) [5 ref. Ja, en] [Japan Food Res. Lab., 52-1 Motoyoyogi-cho, Shibuya-ku, Tokyo 151, Japan]

Rishiri-kombu *Laminaria japonica* var. *ochotensis* and gagome-kombu *Kjellmaniella crassiforia*, both collected at 4 places in Hokkaido, were assayed for As contents in their various parts. Arsenic contents were twice as high in the base as in the top of the fronds, and tended to be higher at the centre of the fronds, particularly at the base. As contents of the cortex were significantly higher than those of the marrow of the fronds; it is suggested that As is concentrated more densely in meristematic tissue, where it may have some metabolic function. Max. As content in any one sample of marrow + cortex was 100 p.p.m. (dry wt. basis). JRR

29

[The chemical form of arsenic in seaweed (sea tangle). I.]
Yoshida, M.; Kashimoto, T.
Proceedings of Osaka Prefectural Institute of Public Health, Food Sanitation [Osaka-furitsu Koshu Eisei kenkyusho Kenkyu Hokoku, Shokuhin Eisei Hen] **11**, 67–71 (1980) [8 ref. Ja]

A 4:1 mixture of water and methanol extracted 89.6% of the As in kombu (sea tangle) and was the best of the solvents tested. Wet digestion with H_2SO_4 and HNO_3 resulted in 88.8% recovery of total As and 91.1% of As in water/methanol. Of the As, 93.5% passed through a spectra pore dialysis tube with pore size 1000 daltons; 86.9% passed through ultra filtration on UK-10 (mol. wt. cut-off 10 000) but 70.8% failed to pass through ultrafiltration on UH-1 (mol. wt. cut-off 1000). Predominant mol. wt. appeared to be between 500 and 1000. The peak of As in kombu on Sephadex G-10 did not correspond to cacodylic acid, phenylarsonic acid, methanearsonic acid or potassium arsenite. The As content of extract retained in ultrafiltration was higher at 0.32% than that of dialysate (0.06%). CIH

30

[The chemical form of arsenic in seaweed (kombu – sea tangle). II.]
Yoshida, M.; Kashimoto, T.
Proceedings of Osaka Prefectural Institute of Public Health, Food Sanitation [Osaka-furitsu Koshu Eisei kenkyusho Kenkyu Hokoku, Shokuhin Eisei Hen] **12**, 85–90 (1981) [5 ref. Ja]

Although 93.5% of the As in kombu could pass through a dialysis tube with a mol. wt. cut-off at 1000 [see preceding abstr.] 87% failed to pass through an Amicon UM05 filter with a cut-off at mol. wt. 500. After gel filtration on Sephadex G-15 the fraction passing through the Amicon filter contained 0.61% As. After TLC on cellulose with butanol:acetone:NH_3:water (10:10:2:5) the As fraction from kombu contained 1.66% As. The R_f for kombu As, 0.13–0.32, did not correspond to methyl-, phenyl- or dimethylarsonates or $KAsO_3$. None of the As from kombu was removed from an active charcoal column by water or 2–4% ethanol but most of it was removed by >15% ethanol, unlike the other As compounds mentioned which were removed in

water but not 20% ethanol. Adsorbed As from kombu was not removed from a column of QAE-Sephadex A-25 by water or aqueous methanol but 80.18% was recovered in 4% acetic acid/methanol. In this instance reducing sugars associated with the As fraction were completely removed from it. [See preceding abstr. for part I.] CIH

31

[Heavy metals in fishery products – a review.] Die Belastung von Fischereierzeugnissen mit Schwermetallen – ein aktueller Überblick. [Review]
Schreiber, W.
Archiv für Lebensmittelhygiene 32 (5) 145–149 (1981) [many ref. De, en] [Bundesforschungsanstalt für Fischerei, Hamburg, Federal Republic of Germany]

Published data on heavy metal contents in marine and fresh water fish and shellfish products in Germany are reviewed. Tabulated data for Hg, Cd, Ag, As, Zn, Co, Ni, Se, Pb and Cu suggest that there is no need to establish new limits for max. contents. RM

32

[Determination of arsenic in products of animal and vegetable origin.]
Polishchuk, L. R.
Gigiena i Sanitariya No. 5, 42–43 (1981) [6 ref. Ru] [Kievskii NII Gigieny Pitaniya, Kiev, USSR]

After a brief discussion of methods for detn. of As in foods, the author describes his own colorimetric method, with details on the optimal conditions for quantitative separation of As from the product, the reaction process and reactants used. Method sensitivity is 0.5 μg As/sample vol., which is 0.04 mg/kg for a 25 g product sample. RAW

33

[Arsenic pollution and its effects on the biosphere.] Arsen-Immissionen und deren Auswirkungen auf die Biosphäre.
Düssler, H.-G.; Auermann, E.; Börtitz, S.
Nahrung 26 (5) 435–443 (1982) [38 ref. De, en, ru] [Sektion Forstwirtschaft Tharandt der Tech. Univ. Dresden, Wissenschaftsbereich Pflanzchem., Dresden, German Democratic Republic]

Problems with pollution of the environment with As from non-ferrous metal smelting plants, phosphate plants and power stations are discussed, with reference to data for As concn. in a wide range of environmental samples. Values for foods include the following (mean value with range, mg/kg): lettuce 14 (2–24); spinach 16 (11–32); parsley 16 (8.5–35); and carrots 2.5 (0.3–6). The health hazard from As-contaminated foods is briefly considered. AJDW

34

[Study on amounts of trace elements in marine fishes. V. Distribution of heavy metals and arsenic in flatfish graymullet and gizzard-shad tissue.]
Katsuki, Y.; Ishii, H.; Itoh, A.; Naoi, Y.; Kimura, Y.
Annual Report of Tokyo Metropolitan Research Laboratory of Public Health 31 (1) 174–179 (1980) [23 ref. Ja] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo, 160 Japan]

Concn. of As and heavy metals in muscles and internal organs of the 3 title fish spp. are tabulated (in En) as means and ranges. Mean concn. in (i) flatfish muscle (33 samples) (ii) and (iii), white and red muscle, resp. of grey mullet (12 + 12) and (iv) and (v) white and red muscle, resp. of gizzard-shad (20 + 20) were as follows (p.p.m. wet basis) for (i)–(v) resp.: total Hg 0.05, 0.02, 0.02, 0.02, 0.02; Pb 0.07, 0.07, 0.06, 0.12, 0.13; Cd 0.01 0.01, <0.01, 0.01, 0.02; Cr 0.06, 0.03, 0.04, 0.05, 0.03; Cu 0.20, 0.16, 2.1, 0.46, 2.9; Zn 4.6, 3.8, 9.0, 4.3, 8.8; Mn 0.10, 0.08, 0.13, 0.64, 0.81; Co 0.02, 0.03, 0.03, 0.02, 0.02; As 1.6, 0.37, 0.64, 0.34, 1.5. [From En tables.] DIH

35

[Accumulation and excretion of dietary arsenic (As) in cattle, and a survey of the As content in the organs of cattle produced in the Tohoku district.]
Tsuneishi, E.; Takeshita, K.; Yoshida, S.; Nishimura, K.
Bulletin of the Tohoku National Agricultural Experiment Station [Tohoku Nogyo Shikenjo Kenkyu Hokoku] No. 65, 167–174 (1981) [23 ref. Ja, en]

Excretion and accumulation of As were investigated in 2 Holstein steers fed a concentrate with added As compounds (90 mg/day as Na_2HAsO_4), and contents of As were also determined in body tissues of 19 beef cattle from 5 different locations in Tohoku district. High intake of As increased tissue As levels, e.g. 2.00 p.p.m. in liver (fresh basis), 0.99 p.p.m. in kidney, 0.6 p.p.m. in muscle. Tissue As levels of the 19 beef cattle were very low. Hair As concn. was a useful indicator of As accumulation in body tissues. [From En summ.] AL

36

Dry ashing, hydride generation atomic absorption spectrometric determination of arsenic and selenium in foods.
Tam, G. K. H.; Lacroix, G.
Journal of the Association of Official Analytical Chemists 65 (3) 647–650 (1982) [13 ref. En] [Food Res. Div., Health & Welfare Canada, Tunney's Pasture, Ottawa, Ontario, Canada K1A 0L2]

A dry ashing, flameless AAS method was evaluated to determine As and Se in foods. Samples were dry-ashed with $Mg(NO_3)_2$-MgO and dissolved in HCl. Selenate was reduced to selenite by boiling in 4N HCl, and arsenate to arsenite by treatment with KI. Hydrides of As and Se were generated by addition of $NaBH_4$ and were swept by N_2 and H_2 into a thermally heated silicate tube furnace. The detection limit was about 5 parts/billion for each element based on a 10 g sample. Analytical results obtained for several samples of NBS reference materials agreed with the certified values. The procedure was evaluated by another laboratory and results were satisfactory. AS

37

[Removal of heavy metals in water treatment.]
Zacek, L.
Vodni Hospodarstvi, B 31 (10) 255–258 (1981) [14 ref. Cs, ru, en] [Res. Inst. of Water Management, Prague, Czechoslovakia]

In the treatment of drinking water, the presence of heavy metals (Hg, Pb, Cr, Cu, Cd, Ni, Zn and sometimes As) is a formidable problem in industrial environments. Results of 5 yr testing show that the most suitable means for eliminating them is (i) alkaline clarification

with ferrous sulphate, (ii) decarbonization and (iii) sorption on activated carbon. To achieve high efficiency with (i) and (ii) the pH must be high enough for heavy metals to be present in insoluble form. Effect of (iii) is very dependent on type of sorbent, dosage, and filtration rate. The correct choice of the appropriate technological procedure for removing heavy metals is also dependent to a considerable degree on the type and concn. of heavy metal concerned, as well as on the overall composition of the raw water. STI

38

[Contents of arsenic, copper, lead and zinc in some fruit and vegetable preserves.]
Jason, K.; Malasiewicz, A.
Bromatologia i Chemia Toksykologiczna **14** (3/4)

317–318 (1981) [9 ref. Pl] [Lab. Chem.-Mikrobiol. Zakladu Spozywczego Osrodka Badawczo-Rozwojowego Produkcji Lesne 'Las', Sopoc, Poland]

Min. and max. concn. of As, Cu, Pb and Zn are tabulated for 15 types of jam and various vegetable preserves (gherkins, red cabbage, red peppers, beetroot) manufactured by the Las food factory in 1977–1979. HBr

39

[Content of arsenic in some commercial fish from the North-East Atlantic.]
Prokhorov, I. A.; Petukhov, S. A.
Rybnoe Khozyaistvo No. 9, 34–35 (1981) [Ru] [VNIRO, USSR]

As was determined in mineralized fish samples after dissolution of the residue in HCl and reduction of As^{5+}, by means of KI and $SnCl_2$, into As^{3+} using Kingsley's & Schaffert's method. Content of As fluctuated between 0.28 and 1.71 mg/kg. Higher concn. was found in liver and red muscle, probably due to a higher ability of these organs to re-synthetize energy-rich phosphates, which have arsenates as analogues. As concn. detected did not exceed the permissible level of 1.5–5.0 mg/kg sample, the limit stated for seafood products in various countries. STI

40

[Toxic metals in raw materials and products of the meat industry.]
Dordevic, D.; Milohnoja, M.; Dujic, I.; Radovic, N.
Tehnologija Mesa 22 (11) 312–315 (1981) [15 ref. Sh, en] [Jugoslovenski Inst. Tehnologiju Mesa, Belgrade, Yugoslavia]

Muscle, fatty tissue, kidneys and liver of cattle and pigs, and canned hams and pork shoulders, were analysed for As, Sb, Cd, Hg, Pb and Se. Data are given for the proportions of samples in which heavy metals were found, and for mean and max. concn. detected (with s.d. and coeff. of variation). Levels of heavy metals in the canned products were within tolerance limits. 13 additives commonly used in meat processing were also analysed. STI

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